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## Original Communications

### THE USE OF FLUIDS IN THE TREATMENT OF HYPEREMESIS GRAVIDARUM*


BY VICTOR J. HARDING, D.SC., AND H. B. VAN WYCK, A.B., M.B.,
TORONTO, ONT.

*(From The Department of Pathological Chemistry, University of Toronto, and The Metabolism Ward, Burnside Maternity Hospital, Toronto General Hospital)*


QUITE recently there have appeared in this Journal two papers[11, 13] dealing with the treatment of pernicious vomiting of pregnancy, the one advocating, at least in certain cases, the use of sodium chloride as "specific neutralizing antitoxic protective" substance, and the other advocating the use of insulin together with glucose. The publication in so short a time of two methods of treatment apparently so different and each reporting a successful therapy, can only mean that even yet the fundamentals of treatment of pernicious vomiting are not understood. In our opinion, in both papers there is a misinterpretation of data.

In order to make clear our position, it is necessary to review briefly the steps which have led to our treatment of hyperemesis gravidarum and describe the routine procedure which has given excellent results in this hospital during the last four years.

The theory of carbohydrate deficiency or glycogen deficiency of the liver as the etiologic cause of the nausea and vomiting of pregnancy was first stated by Duncan and Harding in 1918[1] and published in extenso by Harding in 1921.[2] (Titus, Hoffmann and Givens[3] independently published a similar theory.) It postulated either an absolute or relative lack of glycogen reserve in the maternal liver. It


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allowed a correlation of the fatty degenerated liver found at autopsy in this condition with physiologic fatty infiltration due to hunger, as noted by Mottram,[4] and thus brought in the factor of starvation as one, if not the main, contributory cause of the clinical entity. It is important to note that at no time was the ketonuria, which usually accompanies pernicious vomiting of pregnancy, ever thought to be more than secondary to a lack of carbohydrate and never of itself the cause of the vomiting. Nevertheless, as both the vomiting and the ketonuria were believed to be dependent upon the common origin of lack of carbohydrate, the determination, either qualitatively or quantitatively, of acetone bodies in the urine became an indication of the clinical condition. This fact was later borne out by the work of Harding and Potter.[5] It thus became logical to treat such cases with carbohydrate in an attempt to supply any deficiency, and a scheme of treatment was elaborated by Harding and Watson.[6] Mild cases were treated with small meals, consisting mainly of carbohydrate, throughout the day; more severe cases, where it was impossible to supply food by mouth, were treated by the use of glucose solutions rectally, interstitially, or intravenously, as the case demanded.

From the investigation of a number of cases treated in this manner, it soon became evident that the best laboratory guide for treatment was the observation of the daily excretion of urine. Cases which responded successfully to the therapy showed, coincident with improvement in clinical condition, a greatly increased volume of urine with a lowered specific gravity. The investigation of Harding and Drew[7] on the N.P.N. and uric acid content of blood in vomiting of pregnancy led to the conclusion that the raised values, often found in these patients, were due to dehydration; for, consequent on the production of diuresis, the high values for these substances became normal. The value of this particular piece of evidence has become somewhat weakened by the later discoveries of Harding, Allin, Eagles, and Van Wyck;[8] but further evidence that dehydration plays a marked part in pernicious vomiting of pregnancy has been found in the behavior of the serum proteins during treatment.[9] So important do we consider the factor of dehydration, that any patient admitted for vomiting of pregnancy to the wards of the Toronto General Hospital is at once treated, as a matter of routine, with 1000 c.c. of 5 per cent glucose solution in 1 per cent saline given intravenously each day until a diuresis is obtained. By "diuresis" is meant that the twenty-four-hour output of urine shall reach at least 1000 c.c. and shall have a specific gravity of 1010 or less. During this period of treatment the patient is isolated from the remainder of the ward and no visitors allowed. At the same time rectal enemata of 200 c.c. of 10 per cent glucose in normal saline are given three times daily and at bedtime 30 to 60 grains of sodium bromide are given in each enema for

the first day or so. No attempt is made to feed solids by mouth, but fluids are urged even if the patient is vomiting freely, and she is encouraged and allowed to drink any liquid she may fancy except tea, coffee, milk, or cocoa. This treatment usually results, within three or four days, in such marked improvement that the patient is able to take food. It is not continued for a period longer than six days without clinical improvement. In the event of failure under these conditions therapeutic abortion is performed. The treatment may thus briefly be described as rest in bed with isolation, and the forcing of fluids by all routes. The use of glucose, though important, thus has become secondary to the use of fluids in treating a severe case of pernicious vomiting of pregnancy. The later improvements in treatment were described by Harding.[10]

The first paper referred to is that of Haden and Guffey,[11] who came across a case of pernicious vomiting of pregnancy in which an examination of the blood revealed a slightly raised N.P.N., urea N and uric acid, but more significant, according to their own interpretation, a lowered chloride content and a raised $CO_2$ combining power. Led by the studies of the chemistry of high intestinal obstruction made by Haden and Orr,[12] these authors postulated an analogous condition of "toxemia" and treated their case accordingly. Their patient was admitted May 10, suffering from severe vomiting of pregnancy. On May 11 and 12 they gave 1500 and 500 c.c. respectively of 3 per cent sodium chloride subcutaneously; on May 13, 400 c.c. of normal saline. The amount of fluid given on May 13 and 14 was not recorded, but 1 gram of sodium chloride was given on each day. The patient continued vomiting until May 14, when, according to the report, there was a striking response to the therapy. The blood findings dated May 13 showed normal figures, although perhaps the chlorides might be considered as still slightly low. The urine volumes of May 10, 11, and 12 were not noted. Presumably the amount was small, and we, ourselves, know how difficult it is to obtain complete twenty-four-hour specimens of urine from such patients. For absolute accuracy it demands a special nurse and constant attention. On May 13, however, the urine volume was stated as 1180 c.c.; the specific gravity was not given, but we feel sure from the evidence before us that the urine volume on that day was very much larger and more easily collected than on the previous days, and that Haden and Guffey had reached that stage in therapy which we designate as "diuresis" and which we always find is accompanied by clinical improvement. Our interpretation of the case cited by these authors is that they successfully overcame the dehydration of the patient quite independently of the supply of sodium chloride. This assumes that the cure was not brought about by death of the fetus, an explanation Haden and Guffey are loth to accept. Our position is much strengthened by previous

observations of the chloride content of blood in pernicious vomiting of pregnancy given by Harding and Drew, a paper which Haden and Guffey entirely overlooked. There we found many times a lowered chloride content of the blood, often below threshold value, which rose to a normal figure at the time of diuresis. Our interpretation was that the lowered chloride of the blood was due to the consequent dehydration. It is true that the general case of pernicious vomiting of pregnancy does not show such a lowered content of the blood as was found by Haden and Guffey. The lowest figure observed by Harding and Drew was 330 mg. Quite recently, however, we have been able to observe another case of pernicious vomiting with a low chloride content and raised $CO_2$ combining power, analogous to that of Haden and Guffey, although there was no raised N.P.N. or urea.

CASE 1.—Mrs. P-l-k., age thirty years, para v; two months pregnant. She had been vomiting for six days, her eyes were sunken, her skin dry, and there was evidence of jaundice. She complained of epigastric pain; her pulse was 134, and temperature 100 to 102° F. The urine was highly colored, and of small volume. The blood showed slightly raised uric acid with the NaCl content 290 mg. and $CO_2$ combining power 63.1. For the first two days the patient was treated in the usual way with intravenous glucose, glucose enemata, and urging of fluids. There was an immediate clinical improvement, and on March 21, the third day of treatment, the blood chloride had risen to 412 with a $CO_2$ combining power of 66.4. During those two days sodium chloride had been given in the enemata and the intravenous glucose to the extent of 6.5 gm. On March 21 and 22 the treatment was continued as on the two previous days, except that the sodium chloride was excluded from the intravenous glucose and the enemata. The patient continued to improve, but the chloride content of the blood sank from 412 to 375 mg., the $CO_2$ combining power remaining approximately the same. By this time the patient was able to take a little milk and water and a small carbohydrate meal. Sodium chloride was now supplied with the meals to the extent of 6 gm. a day. The patient continued to improve, and on March 25 the blood chloride was 455 with a $CO_2$ combining power of 63.6. The patient made steady improvement, and on March 27 the sodium chloride was 511 mg. and the $CO_2$ combining power had dropped sharply to 48. The case, therefore, is similar to that observed by Haden and Guffey and was treated successfully without the use of hypertonic saline, and the chloride content of the blood rose or fell in accordance with the intake of salt. The $CO_2$ combining power did not drop until the chloride of the blood was well above the threshold value. Small amounts of chloride appeared in the urine on March 23, 24, 25, and 26, indicating a lowered threshold, but chloride equilibrium was not established until March 27 at a time when the $CO_2$ combining power had fallen to what would be a more normal figure for the condition of pregnancy. The details of the case are shown in Table I. Whatever may be the exact significance of a lowered chloride content of the blood in vomiting of pregnancy, it certainly does not demand the use of hypertonic saline in order to restore chemical equilibrium, and the clinical condition of hyperemesis gravidarum is in no way dependent upon that particular balance of ions.

The second paper is that of Thalhimer,[13] advocating the use of insulin and glucose for the treatment of excessive vomiting of pregnancy. This paper is one of a series published by the same author, in which reports are given of ten cases of hyperemesis gravidarum with

successful results. The author's advocacy of this method of treatment would appear to depend upon two claims. The first, that in this condition we are dealing with a true acidosis brought about by the production of acetone bodies, and the second, that the use of insulin considerably shortens the time of treatment and is thus advantageous. Thalhimer's interest in the treatment of this condition was apparently stimulated by his success in the treatment of some cases of postoperative vomiting,[14] where often there may occur a true acidosis with a lowered $CO_2$ combining power and an increased hydrogen-ion concentration. The usual case of pernicious vomiting of pregnancy, however, does not show any degree of acidosis which we should consider as significant. Judged by the $CO_2$ combining power of the plasma there is a slight degree of acidosis. (We are using this term in a

TABLE II

| CASE | $CO_2$ COMBINING POWER | |
|---|---|---|
| | Admittance | Recovery |
| P-n-t | – | 48.5 |
| H-l | 39.5 | 54.8 |
| D-l-r | 48.4 | |
| N-k | – | 49.0 |
| P-l-k | 63.1 | 50.9 |
| H-y | 42.6 | 53.9 |
| D-l-g | – | 57.4 |
| M-r-s | 40.6 | – |
| R-b-n | 51.3 | 50.3 |

very general way; the finding of a low $CO_2$ combining power of plasma does not necessarily indicate a true acidosis.) Losee and Van Slyke,[15] examining a series of cases of pernicious vomiting of pregnancy, found only a slight diminution of the $CO_2$ combining power when compared with normal pregnancy, and it must be remembered that a normal pregnancy even in its early stages shows a lowering of that figure. Thalhimer is aware of this for he makes reference to some work of Williamson,[16] yet apparently he ignores the conclusion to be drawn, for he states "the figure for a normal alkali reserve being 60." The $CO_2$ combining powers found in cases of pernicious vomiting should be compared with a figure of 50 instead of 60. Harding and Potter in their series of cases of pernicious vomiting were able to find only one case in which the alveoli $CO_2$ tension was significantly low (Case C-k).

In Table II will be found the $CO_2$ combining powers of some recent cases under observation in the Toronto General Hospital before, and after treatment. It will be seen that, compared with the value for a normal pregnancy, the $CO_2$ combining power of the plasma is not significantly low. Moreover, Harding and Potter showed that although large amounts of ketone bodies might be produced, the concentration of these substances in the blood did not rise to the high level com-

TABLE I

SHOWING DETAILS OF TREATMENT, URINE, AND BLOOD ANALYSES IN CASE P-L-K

| DATE 1925 | MEDICATION OR DIET | INTAKE | | | CLINICAL CONDITION | URINE | | | | | BLOOD | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CARB. | SALT | WATER | | 24 HR. VOL. | SP. GR. | ACETONE | NaCl | NOTES | N.P.N. | UREA N | NaCl | SERUM PROTEIN | $CO_2$ COMBINING POWER |
| | | gm. | gm. | c.c. | | c.c. | | | gm. | | mg. per 100 c.c. whole blood | | | per cent | vol. per cent |
| Mar. 19 | 1000 c.c. 5% glucose intravenous Nutrient enemata of 10% glucose in saline | 68 | 4.5 | – | Tongue coated and dry, with sordes. Face drawn and anxious. Skin dry. Slight jaundice and epigastric tenderness. Anorexia; complaining of severe thirst. Pulse 134; temp. 100°-102°; resp. 24. | – | 1026 | ++ | nil | Bile ++ Albumin neg. Sugar neg. | 29.9 | 14.5 | 290 | – | 63.1 |
| Mar. 20 | Same as Mar. 19 + weak tea with sugar | 156 | 6.5 | 2970 | Patient resting more comfortably. Beginning to retain some fluids by mouth. Vomiting infrequently. Pulse 120; temp. 99.2°; resp. 22. | 140 | 1020 | + | nil | " " | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar. 21 | Same as Mar. 20 but no NaCl | 140 | 0 | 2880 | General condition much improved. Skin moist. Pulse 120; temp. 99.4°; resp. 22. | 1100 | 1009 | – | nil | " " | 30 | 9.8 | 412 | 6.18 | 66.4 |
| Mar. 22 | Same as Mar. 21 | 135 | 0 | 2800 | Further improvement. Pulse 124; temp. 99.4°; resp. 22. | 1460 | 1008 | – | nil | " " | | | | | |
| Mar. 23 | Enemata discontinued Milk and water and small carb. meals | – | 2 | 2420 | Retaining meals with only occasional vomiting. Feeling much better and stronger. Pulse 120; temp. 98.2°; resp. 22. | 1110 | 1010 | – | 1.22 | " " | 24.6 | 10.1 | 375 | 7.53 | 64.8 |
| Mar. 24 | Intravenous discontinued. Meals as before and broth | – | 6 | 2480 | Still improving with no further vomiting. | 780 | 1012 | – | 1.63 | Bile + | | | | | |
| Mar. 25 | | – | 6 | 2820 | | 1140 | 1012 | – | 1.84 | Bile trace | 31.0 | 8.7 | 455 | 6.81 | 63.6 |
| Mar. 26 | Light meals | – | 6 | 2730 | | 850 | 1010 | – | 1.70 | Bile | | | | | |
| Mar. 27 | Light meals | – | 6 | 2180 | | 1780 | 1009 | – | 5.34 | Bile absent | 21.0 | 9.5 | 511 | 6.29 | 48.2 |

parable with that found in diabetes, and showed evidence of uncompensated acidosis.

The vomiting of pregnancy is thus usually not characterized by acidosis, although there is always a ketonuria arising, undoubtedly in part, from the starvation accompanying the condition. Without considering whether an uncompensated acidosis per se can produce the symptom of vomiting, there is no doubt that a simple ketonuria does not give rise to this effect. In a recent publication Harding, Allin, Eagles, and Van Wyck[8] described the action of high fat ketonuria-producing diets in pregnancy. These diets produced no symptoms of nausea or vomiting, although in some cases the ketonuria was marked. Moreover, we have given these same high fat diets to one or two patients who had just recovered from pernicious vomiting, under the treatment described, without reproducing the symptoms.

The use of insulin in order to abolish ketonuria is thus clearly unnecessary. Its use in skillful hands may be harmless, but we do not believe it to be a valuable adjuvant to treatment. While this is true, we should not like, however, to deny that there may be an occasional case of vomiting of pregnancy in which the production of acetone bodies becomes so great, or their elimination becomes so impaired that a condition of true uncompensated acidosis may occur and the patient pass into coma. Here the use of insulin would be clinically justified. We should clearly recognize, however, that the insulin is used to combat the coma or impending coma, and not pernicious vomiting of pregnancy per se. The level of $CO_2$ combining power is, however, no index of the severity of the clinical condition. Thus, our most serious cases were undoubtedly D-l-r and P-l-k where the values were 48.4 and 63.1. It would be justified also were we able to prove in this class of patient an inability to utilize carbohydrate based upon a lack of insulin. Such an inability is very improbable. It is impossible, of course, to utilize the glucose tolerance test in this connection, but we ourselves, and Titus and Givens,[17] have determined blood sugars, only to find normal figures. The utilization of glucose given intravenously is normal. Such an injection should, of course, be given slowly, and Thalhimer's remarks and directions on this point are excellent. Most physicians are afraid to give daily intravenous glucose solutions, yet their use is attended with no untoward results, provided proper care is taken in the sterilization of the solutions, and the temperature and rate of administration are carefully controlled. Although we have thus stated our belief that glucose is utilized by this class of patient, we do, however, think the effect of continued dehydration upon glucose tolerance worthy of further investigation.

The second claim of Thalhimer's for the use of insulin would appear to rest on a comparison of his own results with those given by Harding and Potter. The cases cited by Harding and Potter were those in-

vestigated early in the history of this work, and where an intravenous or an interstitial glucose solution was only given occasionally. Even so, a study of the protocols reveals that the majority of cases were able to tolerate light carbohydrate meals on the third or fourth day. As stated in the forepart of this paper we then became impressed with the importance of dehydration, even when, from a clinical viewpoint, it did not appear to be very great. We have examined our more recent records and find that in uncomplicated cases the patients are able to take small meals in from three to six days. The average for fourteen cases is 4.1 days from admittance to cessation of vomiting and the taking of food.

A study of the cases cited by Thalhimer shows that he has carried out a very similar form of treatment, plus the use of insulin. By use of intravenously given fluids Thalhimer has overcome the dehydration of his patients and brought about the improvement in their condition.

## CONCLUSION

The successful treatment of hyperemesis gravidarum depends upon the use of fluids.

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# REPORT OF A CASE OF ECTOPIA VISCERUM, RACHISCHISIS, MALFORMATION OF THE SACRUM, PELVIS INVERSA, HYPOPLASIA OF THE THORACIC DUCT, AGENESIS OR HYPOPLASIA OF VARIOUS ABDOMINAL VISCERA AND PLACENTA PREVIA

By Ralph G. Mills, M.D., and Bernard E. Walpert, M.D.,
Chicago, Ill.

*(From the Department of Pathology, University of Chicago, Chicago, Illinois.)*

THE case here reported appears to be unique in its combination of abnormalities; search through the literature fails to reveal a similar instance. Some are more extensive, others combine different sets of anomalies, but the exact counterpart was not found.

The parental history contains nothing that appears to have any bearing upon the cause of this abnormality, the details are given, however, for the sake of completeness.

*Clinical History.*—T. G. B., housewife, age twenty-seven, Polish. She has been healthy all her life; had measles at the age of ten years. Worked as a housemaid when single. Menstruation began at fourteen, regular, twenty-eight-day type, without pain or discomfort. Has been a little anemic for some time past. No x-ray examinations.

Husband well and healthy. No history or evidence of syphilis or other venereal disease. Has been a rather heavy drinker of alcoholic liquors for a number of years.

*Obstetrical History.* Married nine years, V-para. Children normal, all living, all delivered by a midwife during easy and normal labors. Complete recovery. No miscarriages.

*Present Pregnancy.* Last menstrual period April 14, 1924, termination of pregnancy expected Jan. 19, 1925. Delivered Nov. 26, 1924, calculated age of child about seven months.

First months of pregnancy were passed without any untoward symptoms. Fetal movements felt at nineteen weeks. Has had some pain, occasionally quite severe, in the epigastric and hypochondriac regions on both sides, present in any position, but aggravated on lying down, greatly disturbing her sleep and rest. At about the end of the fifth month of gestation the patient fell into a shallow ditch striking her right knee and elbow against the soft ground, contusing them slightly, but the abdomen was not injured to the slightest degree.

Three weeks before delivery, while in the recumbent position and without the slightest known provocation, a hemorrhage of a serosanguineous character appeared, continuing for one day, during which time she continued with her housework. Three days later it reappeared, lasting for another day. It returned again two weeks later, or two days before delivery. Some clots were passed. It was supposed to have been associated with lifting a bucket of coal. Fetal movements were not felt after this time.

Typical labor pains began next day, and continued throughout the day. In the evening the hemorrhage increased in severity and the patient's anemia became so

noticeable that the midwife called a physician, who diagnosed a placenta previa centralis. The presenting part was of a very puzzling character. No fetal outlines could be made out.

*Operation.*—Manual dilatation of the cervix, and rupture of the membranes, enabled a diagnosis to be made of transverse presentation with what appeared to be


Fig. 1.—Front view of fetus showing the probable position of the arms and legs in utero. The anterior abdominal wall is short and has been reflected upward to show the position of the viscera. Note the evidences of maturity of the upper portion of the body and the abnormal shortness of the lower half.

*D*, right half of the diaphragm; *H*, heart; *L.L.*, left lung; *L*, liver; *C*, colon; *St*, stomach; *Sm. I.*, small intestine; *P*, placenta; *Memb.*, amniotic membranes; *Sp.*, spleen.

the fetal abdomen at the parturient canal. Podalic version was performed, and attempts made to bring down a leg in the usual manner by hooking two fingers in the hip of the fetus. No leverage could be secured and had to be abandoned as the fetal legs seemed to be firmly set in complete abduction. There seemed to be no hope of placing them in the reversed position. By diverse and painstaking maneu

vering, success was finally attained by bringing down first the left and then the right leg, followed immediately by the body as far as the shoulders, the delivery of which plainly revealed the abnormal character of the fetus, since practically all its viscera were outside the abdomen and wrapped up with the placenta. Similar difficulties were encountered in the delivery of the arms, since they too, were found to be firmly fixed in abduction. The after-coming head was delivered with comparative ease. The child was dead, but not macerated. The amount of liquor amnii was scanty.

*Postpartum notes.*—The hemorrhage ceased immediately and there was no abnormal amount of lochia. No postoperative rise in temperature. The patient re-

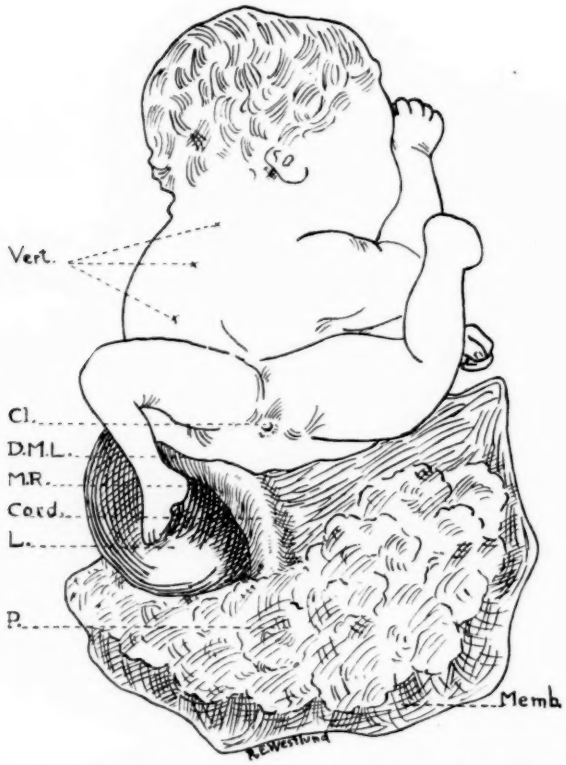


Fig. 2.—Back view of fetus. Note the straightness of the vertebral column and the relation it bears to the cloaca. *Vert.*, vertebral column; *D. M. L.*, demarcation line between the normal skin and the membrana reuniens; *M.R.*, membrana reuniens; *L.* liver; *P*, placenta; *Cl.*, cloaca; *Cord*, umbilical cord; *Memb.*, amniotic membranes.

mained in bed for nine days and made an uneventful recovery except for a little bleeding for a period of about six weeks.

The clinical notes and personal history had to be obtained from the patient after delivery, as the physician was called only two hours before the birth of the child and had no previous opportunity to examine the patient. There is no evidence of any examinations by the midwife.

## AUTOPSY PROTOCOL

### Gross Description

*External Appearance.*—The body is that of a fetus, which in the upper half of the trunk appears to be well formed and fully matured. It measures 37 cm. in

length, from the top of the head to the tip of the toe of the right leg, the one which is capable of being extended to the greatest degree. The weight, excluding that of the placenta, is 2,000 gm.

*Evidences of maturity.*—The skin is smooth and shiny, and lanugo is everywhere present. The head and shoulders are covered with the usual amount of vernix caseosa. The cartilages of the nose and ears are well developed. The nails of the fingers project well beyond the tips of the fingers, while those of the toes are slightly shorter. The cranial bones are well ossified and are in contact at the sutures. The occipitofrontal circumference of the head is 33 cm. and that of the shoulders, exactly the same. The hair of the head measures 3 cm. in length.

*Head.*—The head is well formed and presents no obvious abnormalities. It is symmetrical, except for a very slight prominence of the right frontal eminence.

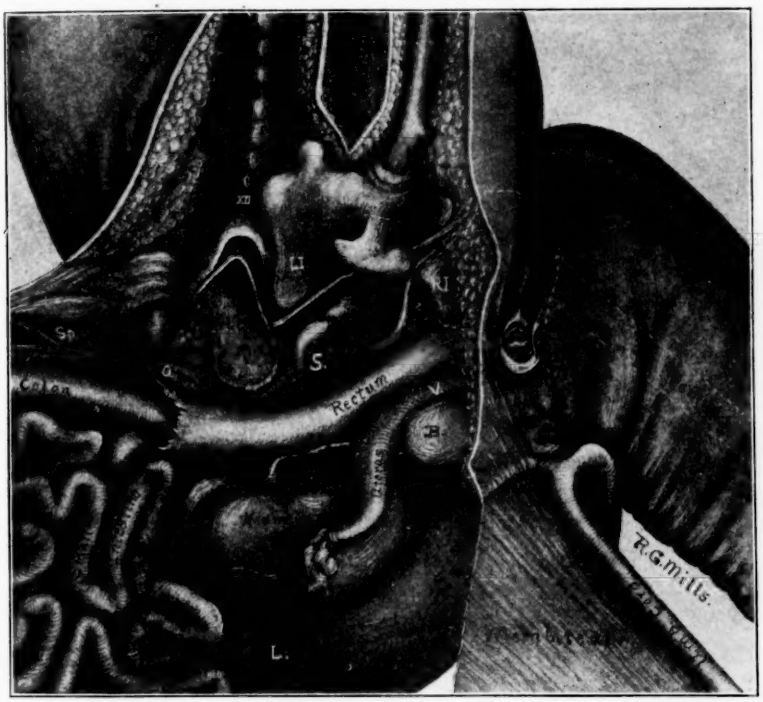


Fig. 3.—Drawing of a dissection of the structures of the back. The left leg passes upward and the right leg stretches to the right of the figure. *XII*, twelfth dorsal vertebra; *L.V.*, lumbar vertebrae; *S*, sacrum; *M*, myelomeningocele; *L.S.N.*, left sciatic nerve; *R. S. N.*, right sciatic nerve; *L. I.*, left ilium; *R. I.*, right ilium (partly in outline); *C*, costal margin; *Memb. reun.*, membrana reuniens; *D. M. L.*, demarcation line between skin and membrana reuniens; *B*, bladder; *V*, vagina; *L*, liver; *A*, adrenal; *Ov*, Ovary; *Sp.*, spleen.

*Trunk.*—The arms and shoulders are well formed and present no abnormalities. The chest is greatly compressed, the diameter, measured from the left nipple to the tip of the right scapula, being 3½ cm., while the opposite diameter measures 7½ cm. The free margin of the ribs extends 5½ cm. below the nipple, and is the same on both sides. The right side of the chest extends 6½ cm. farther forward on the right than on the left. The xiphoid process begins ½ cm. below the nipple line and is 3½ cm. below the episternal notch. The epigastrium protrudes, and through the thin abdominal wall may be felt a large round mass.

Posteriorly the chest conforms to the description as given above. The spinal

Fig. 4.—X-ray taken from the left posterolateral position. The curvature in the spinal column is a moderate lordosis and not a scoliosis. (cf. Figs. 1 and 3.) At the lower end, representing the lumbar vertebrae there is an obvious separation of the ossification centers which marks the site of the myelomeningocele. The indefinite mass at the right of the apparent end of the spine is the sacrum. Above and to the right of this may be seen the two femora, in relation to indefinite shadows which represent the portions of the pelvic bones. The dense shadow behind is the heart. The fracture of the left femur shows somewhat higher, where it lies above the ribs on the right side.

Below the body are the coils of small intestine on the left overlying the placenta below, which is separated into two portions (ruptured during delivery). The liver, kidney and other viscera are above the placenta. The skull shows the saw cut by which the calvarium was removed.

column is straight in the upper dorsal region, but in the lumbar portion its course cannot be definitely determined. The buttocks point backwards, a cloaca occupying a position where naturally the right hip should be. The outer convexity of the legs is in contact with the back, and touches the tips of the scapulae on either side. The left thigh lies in a groove in the back corresponding to the deformity of the chest, the right arm and right leg being in actual contact. The articulation of the femora is uncertain as to its exact relations to the pelvic bones, but there is no ankylosis. Motion is considerably limited by the skin over the sacral region, which, instead of following the axis of the spine, traverses the cord of a circle and is firmly united with that of the mid-dorsal region. There is included a considerable mass of tissue beneath the skin, between it and the spinal column beneath.

The right leg is about the usual size in the thigh and calf, but lies in an unnatural position, pointing upward until it probably lay near the face. The inner surface, which is here the outer one, is greatly flattened and the foot is bent into an extreme talipes calcaneovalgus position. The left leg is much smaller than the right, the thigh extending upward and outward until the knee rests just over the left scapula. The lower leg then turns downward parallel with the axis of the body. The calf is still smaller, the motion at the knee being greatly limited by contraction of the skin in the popliteal region. The foot is flattened and somewhat misshapen, assuming an equinovarus position. Over the left trochanteric region is a small teat-like projection of the skin which is soft and without definite form or structure. In the midline of the buttocks there is another, but smaller cutaneous appendage. These probably represent the labia.

*Cloaca.*—In the usual anal region is a single opening, somewhat larger than normal, and covered by a tab of skin which projects from below upwards. Drawing this aside and downwards there is exposed a bluish-colored mucous membrane lining a shallow pit. From the center of the pit there projects forward the lips of a sinus somewhat suggesting the cervix, but longer and more membranous. A probe passed through this goes to a depth of about 1 cm. The lips of the central cavity lie closed unless opened with instruments. There are two smaller openings into the cloaca, one above and one below.

*Failure of abdominal walls to unite.*—In the upper portion of the abdomen the skin comes to an abrupt end. Down to a definite line the skin is normal in appearance, and is well vascularized. This line of demarcation is 6 cm. below the ensiform, 3 cm. below the right margin of the ribs, 2½ cm. below the cloaca and ½ cm. below the left costal margin. Below the demarcation line the skin is continuous with a thin undifferentiated membrane which contains no visible blood vessels. This membrane is about 1 cm. wide in front, but posteriorly is extended to a distance of 12 cm. at the point where it is reflected onto the inner surface of the placenta.

*Umbilical cord.*—The cord begins at the demarcation line between the skin and the thinner membrane, about 2 cm. below the right costal margin. It continues backward following the demarcation line, and diverges from it 2½ cm. below the cloaca. From this point to that at which it is attached to the surface of the placenta it has a length of 5 cm. It is irregular in width throughout its course, and has a wing of thin membrane attached to its opposite sides, continuing down to and onto the placenta. There is a large ragged hole through the membrane between the attachment to the cord and that portion described above, as being the longest portion. This hole appears to be of traumatic origin.

The thin membrane appears quite irregular in structure in its different portions, in some places seeming to be double. This point is not very clear in most areas.

*Protrusion of abdominal contents.*—As the body lies on the table, most of the abdominal viscera protrude from under the costal margin. The liver on the right side is entirely exposed, the gall bladder notch occupying the lowest position. It is attached to the lower surface of the membranous diaphragm at that point in the

dome which is adjacent to the upper side of the left lobe. The quadrate lobe is distinct, protruding through a hole in the peritoneum just above the lesser curvature of the stomach. The stomach is vertical in position, but is found in approximately the normal region. The spleen is attached to the posterior side of the stomach by a group of vessels and by its ligaments. The transverse colon lies immediately below the greater curvature of the stomach, but is reversed in direction as rotation has not taken place. Below the colon are to be seen a number of loops of small intestines. There is no omentum. When the body is turned over the organs appear in the some position as just described, except that the central area is occupied by a rounded mass lying in a sac, the upper and posterior part of which is attached to the tip of a long conical flexible body which projects downward from the region of the cloaca. Attached to the tip of this conical body is a twisted narrow tube which ends in a small fimbriated structure. Below the left costal margin is a lobulated mass resembling an adrenal and just behind it a smaller mass of uncertain nature.

### Description of the Organs

*Heart.*—This organ occupies a median position in the epigastrium, the pulmonic valve lying immediately beneath the xiphoid process. It is normal in its general relations, and the anterior surface is composed largely of the left ventricle. It measures 3 x 3 cm. and is structurally normal. The foramen ovale is open. The heart is completely enveloped by the pericardium, which is normal in all respects.

*Lungs.*—The *right lung* is completely enveloped in the pleura which has the usual form and relations. The lower, or diaphragmatic surface, is in contact with the membranous diaphragm to be described later. The right lung is small, not expanded, and has suggestions of three lobes. The *left lung* is partly enclosed in a pleura which extends upward only as far as the fourth rib, and below its cavity is continuous with that of the peritoneum, the diaphragm in this region being absent. It is normally formed and divided into two lobes, and has not expanded.

*Thymus.*—This is grossly lobulated in structure, occupies the entire anterior mediastinum from the base of the heart upward, passes beneath the clavicles and reaches to the lower edge of the thyroid. It is normal in appearance and structure.

*Diaphragm.*—This occupies the usual position on the right side, but is membranous in structure with the exception of the ring of attachment to the body wall and a slender band which extends from the vertebra behind to its attachment to the anterior abdominal wall. The left half of the diaphragm is missing, allowing the left pleural cavity to communicate with the peritoneal cavity. Transversely across the posterior wall at the point of normal attachment of the diaphragm is a muscular ridge; this is absent on the anterior surface.

*Liver.*—This is a flattened globular organ, occupying the usual situation but hanging free, being attached above to the under side of the diaphragm, and presenting on its anterior face two notches, one in the upper right side for the umbilical vein which, in this instance, comes in from above instead of from below. (The umbilicus is represented by the insertion of the cord, which is just under the tip of the right costal margin.) The gall bladder notch is on the lower left and free margin. Attachment is maintained by slender adhesions to the diaphragm above and by the group of vessels in the hilum, which bring it into close relations with the stomach. On the surface are seen several subcapsular hemorrhages. The *gall bladder* is represented by a slender, ductlike structure lying in the bottom of a deep groove. Its relations appear to be normal. The liver measures 7 cm. vertically, 8 cm. horizontally and 3½ cm. anteroposteriorly.

*Spleen.*—This is a flattened tapering body measuring 4½ x 3 x 1 cm. It is attached by the hilum, from which emerge the normal vessels, enclosed in the fold of peritoneum representing the gastrosplenic ligament. There is no attachment to the kidney. On the surface are no moulded areas indicating pressure. The structure is

normal. There are two very small *accessory spleens* attached to the ligaments near the hilum.

*Pancreas.*—This organ is 3 x 1 cm. in dimensions and occupies the usual relations to the spleen and duodenum. It appears normal in every respect.

*Gastrointestinal tract.*—The stomach is a free-lying organ, almost vertical in position, and measures 5 cm. in length. The *esophagus* above and the small intestine below are in normal relation to it. It contains a small amount of brownish mucus. The loops of *small* intestine hang loosely and have normal mesenteric attachment. There is no Meckel's diverticulum. The *appendix* is normal. The *colon* lies in a large loop across the abdomen just below the stomach, but it has not rotated. The lower portion of the colon bends backward and upward to its end in the *cloaca*. The terminal 5 cm. of the intestinal canal is ensheathed by a muscular tube, which at the upper end, is scarcely attached to it. This represents the muscular walls of the *rectum* which have grown upward and have ended abruptly in the form of a sleeve. The lower bowel contains a small amount of meconium. The *anus* is patent.

*Adrenal.*—Only one adrenal is found and is presumably the left. This lies immediately below the muscular ridge which represents the left side of the diaphragm, and is covered with peritoneum. It measures 2½ x 2 cm. and is relatively quite large. On section it appears normal.

*Kidney.*—Only one kidney is present and this lies to the right of the midline behind. This organ is enclosed in a fold of peritoneum, which is a complete sac. This is believed to be the *right* kidney because of the course taken by the ureter attached. There is a band passing from the lower pole to the mesentery of the colon and the upper pole is firmly attached to the lower portion of the liver. It measures 5 x 3½ x 2 cm. The capsule is thin and strips readily. This, however, is quite firmly attached to the fold of peritoneum which surrounds it. On section the cortex and pyramids appear normal. Only one pelvis is present, and this is normally related to the calices. The *ureter* is relatively large, and contains a very slight amount of yellowish fluid. It is not quite uniform in diameter, but there are no definite dilatations. It follows a circuitous course upward, lying in contact with the right side of the uterus and opens by a patent orifice into the bladder.

*Bladder.*—This is a small well-formed normal appearing organ, measuring 2 cm. in both diameters. On section the mucosa is found to be in folds. Only a single ureteral orifice (right) can be demonstrated. The urethral orifice is patent and a probe passes easily into the cloaca. There is no urachus present.

*Genitalia.*—The *vagina* is a small normal-appearing cavity which opens into the cloaca. Its walls are thrown into folds and no abnormalities are seen. The hymen is represented by a lipped orifice in the center of the cloaca. The vagina is the basal undifferentiated portion of a conical elastic body, 1 cm. in diameter at the base and 5 cm. in length. The terminal part is the *uterus* with a simple cavity of small diameter which tapers off into a single *fallopian tube*, which is attached directly to the tip. The walls are tough and dense, cutting like fibrous tissue. There is no suggestion of a fundus. The fallopian tube is rather tortuous and very small in size. Its patency could not be determined. The irregularity of the tube makes it uncertain whether the entire mass is composed of the maldeveloped tube or whether there is also present a rudimentary ovary. The mass is terminated by a fimbriated structure. There is a structure lying just posterior to the adrenal, which is believed to be an *ovary*. This lies buried in a fold of peritoneum, and on the surface is a small cauliflower-like growth, which looks like the vesicular appendage of Morgagni. On section it has a homogeneous structure and at the base, near the point of attachment, is a circular body of unknown character.

*Sex.*—This is determined to be female.

*Placenta.*—This structure is 15 x 13 cm. in diameter, and has been ruptured half-way across, almost to the point of attachment of the cord. A fibrinous clot is still attached to the traumatized edges. The cotyledons appear normal and no unusual features are seen.

*Neck organs.*—The *thyroid* and *parathyroid* glands are normal. No abnormalities are seen.

*Aorta and vessels.*—The general structure and course of the aorta in its thoracic portion are normal. The branches which pass to the upper portion of the body are normal in arrangement and relations. The ductus arteriosus is patent. At the level of the diaphragm there are several small branches given off to the muscle of this structure, and a small one to the rudimentary left half of this body. The *abdominal aorta* passes directly downward giving off the usual branches in the epigastrium, except that there is no right ovarian or adrenal branch, the ones to the left organs being present. The celiac axis is very small and somewhat irregular in distribution owing to the abnormal position of the organs supplied. The right renal artery is present and passes to the only kidney found. At this point the course of the abdominal aorta is directly backward, passing close to and around the end of the spinal column, which in this region is bent abruptly backward. In this recurved portion are given off the branches to the ovary, adrenal and kidney as above mentioned. The iliacs are very small and pass to the corresponding lower extremities. The single umbilical artery is very large and a direct continuation of the aorta.

*Lymphatic System.*—The thoracic duct begins about 2 cm. above the diaphragm by the union of two very small vessels leading from the adjacent tissues and traverses an irregular course on the right side of the vertebral column. At about the level of the fourth dorsal vertebra it passes obliquely to the left side in the general direction of the left subclavian vein. The exact point of entrance was not determined, but the size of the vessel would indicate that there was no obstruction in its course.

*Osseus system.*—The chief malformations have been described above. In addition it is determined that the processes of the lumbar vertebrae are missing, leaving a hole through which protrudes a myelomeningocele. The sacrum is a malformed body, continuous with the lumbar vertebrae, but bent abruptly backward and to the right until its posterior surface is directed downward. It comes into rather close contact with the ilium of each side, but the pelvic girdle is not properly formed. The obturator foramen is lacking on both sides and the portions of the girdle would not be recognizable as such morphologically. The relation to the acetabulum has been preserved, although the upper portion of the right femur is enlarged and misshapen. The bones of the feet have been malformed incident to the unusual position of the lower extremities. There is a fracture of the middle third of the left femur, but the surrounding tissues are not infiltrated with blood.

*Muscular system.*—The failure of the abdominal wall to develop and the absence of the left half of the diaphragm are the most noticeable abnormalities. The muscles of the hips are much misplaced by the abnormal position assumed by the legs, and their relations to the pelvic girdle are disturbed.

*Nervous system.*—The brain exhibits no definite abnormalities. The upper portion of the *cord* is apparently normal and the branches given off in the upper portion of the body are seemingly well formed and properly distributed. In the lumbar region, immediately below the body of the last dorsal vertebra, the dorsal processes are absent, leaving a hole through which a tubular process formed of the membranes of the cord protrudes. This myelomeningocele is about 3 cm. in length and extends downward over the malformed sacrum. Within are to be seen some of the small branches forming the cauda equina spread out over its inner surface. The two sciatic nerves, however, are not involved in the sac, but pass out behind it and are seen running to the left and right legs. All the other branches are

found in the sac. The sciatic nerves, particularly the right one, are of good size and follow a course as direct as possible, considering the abnormal position of the pelvic bones.

## MICROSCOPIC EXAMINATION

Examination of various tissues confirms the gross diagnosis and adds the following information.

1. Wall of the spina bifida. This is composed of numerous nerves supported by fibrous tissue such as found in the dura, and by fatty areolar tissue.

2. Portion of termination of fallopian tube continuous with the uterus. There is a small ring of mucosa arranged in folds, such as lines the fallopian tubes. In addition there is a small mass definitely separated from it which is a rudimentary ovary containing numerous follicles.

3. Small mass supposed to be an ovary. This proves to be such, and the nodule close to it of unknown nature is a portion of a fallopian tube.

4. Demarcation line between the skin and the membrana reuniens. The skin with its rudimentary glandular structures comes to an end and is continuous with a structureless membrane composed of strands of fibrous character, but not supplied with glands or blood vessels.

5. Umbilical cord. This is relatively normal in general structure, contains a large vein, one large and one small artery. The latter is normal in appearance, but is empty. There are no signs of vestigeal structures. It is partly surrounded by amnion of characteristic structure and appearance.

## ANATOMIC DIAGNOSIS

History of placenta previa centralis, artificial rupture of the placenta, version and extraction.

Maldevelopment of the processes of the lumbar vertebrae, with myelomeningocele.

Maldevelopment and lateral displacement of the sacrum.

Upward and lateral displacement of the pelvic girdle to the right, pelvis inversa, with corresponding alterations in the relations of muscles and associated structures.

Moderate lordosis and slight scoliosis.

Hypoplasia of the thoracic duct.

Congential absence of the anterior abdominal wall, with complete ectopia viscerum.

Congenital absence of the omentum.

Displacement of the heart downward and slightly to the right.

Absence of the left half of the diaphragm, with maldevelopment of the right half.

Absence of the left diaphragmatic pleura.

Failure of rotation of the colon.

Absence of the left kidney and right (?) adrenal.

Hypoplasia of the right (?) ovary and fallopian tube.

Persistence of the cloaca.

Compression deformity of the thorax.

Partial atrophy of the left leg.

Left talipes equinovarus.

Right talipes calcaneovalgus.

Abnormal development and shortening of the umbilical cord, with reduction in size of one umbilical artery.

Accessory spleens.

Subscapular hemorrhages in the liver.

Accidental obstetrical fracture of the left femur.

## DISCUSSION

The mechanism by which anomalies might have been produced has been discussed in almost every report published in the last seventy-five years. "Maternal impressions" as an hypothesis took the place of the still more vague beliefs in the influence of "malignant spirits." During the past forty years there have been developed numerous theories by which to explain deformities on a mechanical basis. The older anatomists and obstetricians studied large series of cases and drew from them deductions as to the possible sequence of events and the influence of one upon another, thus laying the foundations for our present knowledge of embryology. Serious objections have been raised against each of these theories in turn, until the exceptions to a rule almost outnumber the cases which conform to it. Numerous writers, principally the German and French, have sought to modify the previous theories to fit the individual case which they reported. The literature has therefore become extremely complicated by this form of analytical reasoning. In fact, it seems that advancement through this form of study has almost reached its limit.

Relatively little attention has been paid to the possible influence of fluid accumulations in the body, except in the amniotic cavity, and the results of changes in osmotic pressure in the different parts of the body and at different stages in its development have been little appreciated.

Retroflexion of the spine in very young normal-appearing embryos has been occasionally observed, and was figured by His[1] as a possible normal stage in development. This has been disputed by most embryologists who consider this as purely accidental. It seems likely that it occurs during preservation of the specimen, from differences in osmotic pressure between the fixing fluid and that of the amniotic cavity before the latter has completely enveloped the embryo.

Ahlfeld[2] developed the idea that the belly stalk is responsible for many malformations of the fetus. Sudden increase in the amniotic fluid might draw the intestines away from the vertebral column and thus interfere with the closure of the abdominal wall. The vesicle was supposed to be a sac which, if it remains unconnected with the exterior, might fill with excretion, and becoming thin, finally burst. Its front wall would be lost and the hinder part remaining would become covered with mucous membrane, an ectopic bladder resulting.

Abt[3] laid more stress upon fluid accumulations than most other writers have done. He has gathered instances of stasis, hydrops of cavities, edema of local tissues, decrease in the number of red corpuscles and anomalies of blood vessels as instances of fluid or vascular abnormalities.

Dakin[4] reported a case of marked retroflexion of the spine in which

there was a large cyst in the abdomen. When this was perforated the spinal deformity disappeared. It seems reasonable to assume that a cyst on one side, or the greater accumulation of fluid on one side made possible by a weakening of the ventral wall, might cause a lateral bending of the spinal column to the opposite side. The presence of a large abdominal hernia on one side has been repeatedly observed, usually on the side opposite the convexity of a markedly scoliotic spine. The spinal deformity has been interpreted by some writers as a result of the eventration, and by some as its cause.

The accumulation of fluid in the cavities of the brain when the normal exit channels are closed has been shown by Dandy and Blackfan[5, 6, 7] to produce hydrocephalus in man and in animals. The same might be true of hydrorachis leading to spina bifida, but in this instance the results would be less marked because of the yielding nature of the elements composing the spinal column. The pressure is thus relieved at an early stage and less deformity results. The general opinion of embryologists and some of the evidence from experimental embryology is opposed to this view. The number of cases of even large meningoceles without spinal deformity and without disturbances other than nervous, would indicate that hydrorachis is not an important deforming factor in most instances. A small meningocele in the presence of marked spinal abnormality may be taken to indicate the bulging of the dura through an area unprotected by its normal bony covering. Such it appears to be in the case here reported.

Hydrops of the various cavities of the trunk have been reported from time to time. Ascites is the most common of these, and its importance is usually considered in relation to dystocia. Occasionally adhesions between the viscera have been mentioned and the suggestion has been made that, in the absence of obvious infection, the cause might be the entrance of amniotic fluid through some rupture of the wall. The possible relationship between incomplete development of the thoracic duct and congenital ascites has not been discussed in any of the references consulted. It has been mentioned, however, as a possible explanation of congenital edema. (Smith and Birmingham.[8]) Fluid accumulations in the pleura and pericardium are very rare.

Cysts of unknown origin have been noted in various parts, particularly of the abdomen, and cystic distention of the different hollow organs has been frequently reported. Distended bladder from urethral obstruction, hydronephrosis, cystic kidney, cysts of the urachus, and many other varieties have been recorded. It is doubtful whether these have any influence upon degenerative changes other than those in the organs concerned.

External pressure has been stated as the cause of many malformations. An excess of fluid, as in hydramnios, has not been considered to be as important a deficiency as oligohydramnios, in which the pres-

sure of the uterine walls becomes applied to the body at an unusually early stage of development. Amniotic adhesions are often associated with this condition and have served to confuse the picture. Opinions have differed widely as to the importance of these phenomena, but the fact remains that both may be associated with the most profound alterations in structure and function. The absence of both in some of the most marked malformations tends to detract from their importance as causal factors.

External pressure is found to be greatest in cases of ectopic pregnancy, but in a series of 87 cases reported by von Winckel,[9] in which fully 50 per cent were deformed there was not a single instance in which the spine or abdomen were particularly abnormal.

There is reason to believe, then, that the real cause of many of these most profound disturbances must reside within the fetus itself. The recent experimental work of Little, Bagg, and Naujoks,[10, 11,12, 13] with the x-ray on animals tends to confirm this point of view. Not only may malformed animals be produced in this way, but if they are capable of reproduction, the germ plasm may be so altered that their offspring may be deformed. There is no history, however, of the x-rays having been used on the mother of this abnormal fetus.

In the normal process of growth the metabolic changes in certain parts which accelerate growth and those which inhibit it in other portions must involve marked changes in fluid tension. Even a slight abnormal increase in such a situation as the abdominal cavity might so interfere with the union of the anterior wall that a condition similar to that here described would result. The intensity of this condition and the stage at which it occurred might explain the varying degrees of ventral defects from simple umbilical hernia to complete absence of the abdominal wall. An early appearance would prevent the closure while a later one, in the presence of a wall already well formed, would lead to a large ventral or umbilical hernia with a relatively narrow neck. Only the early appearance of increased intra-abdominal pressure would lead to malunion of the urogenital system and a diastasis of the symphysis pubis. Continued pressure would interfere with vascular and nerve supply to the organs, and would account for the anomaly of a perfectly formed organ existing beside a rudimentary one. The existence of pressure at the time an organ is being differentiated would determine its atrophy or complete disappearance.

There is very little evidence, from a careful study of the fetus, that would point to the site of such an accumulation, or that would indicate the stage of development at which it occurred. Nor is it to be supposed that this would necessarily explain all the deformities which have been observed. It is not even certain that there ever was such an accumulation of fluid, for it is unusual to find adhesions or other

structural alterations in hydropic conditions in later life. This general theory is, however, put forward as an explanation for many anomalies which are now attributed to pressure or some mechanical influence coming from the uterine walls or exerted upon the fetus from the exterior.

The following tentative explanation is offered for the developmental defects observed in this case based upon the assumption that some alteration in osmotic pressure or insufficient drainage caused a large accumulation of fluid in the abdomen some time during development. The upper half of the body, including the head, shoulder girdle, arms, and thorax with its enclosed organs are essentially normal. As development takes place from the head toward the tail end of the embryo we may assume that conditions were normal during the early weeks of development. The spine is practically straight and normally formed down to the first lumbar vertebra. Here a small myelomeningocele is found replacing the arches of all the lumbar vertebrae. The size of this cystic structure would suggest that it had little effect upon any deformity except possibly that of the vertebrae concerned. The sciatic nerves pass out under normal conditions and only the smaller branches of the cauda equina are involved in the wall of the sac. Hydrops of the spinal canal is therefore not probable.

Hydrothorax is excluded by the fact that only one pleural cavity opens into the peritoneum and this is the one so greatly compressed. The tissues between the two pleural cavities have not been abnormally thinned and there are no anomalies of the vessels in the vicinity upon which a distended pleura might press. The diaphragm has once formed and then been stretched until the right side has become very atrophic and the left side widely perforated. The presence of the large fetal liver may have partly protected the right side. In nearly every case of partial defect of the diaphragm the left side has been the one involved. Bayne-Jones[14] reports an exception to this statement together with a systematic survey of the reported cases of perforation. It is assumed therefore that the defect in the diaphragm was the result of increased pressure from below rather than from that originating above.

The pericardium is completely closed and bears a normal relation to the heart. There is no evidence of any fluid accumulation within its cavity.

In the urogenital system there is no sign of hydrops of any organ. The single kidney is normal in its structure and appearance. It is nowhere cystic and not of the horseshoe type. The ureter is patent, it opens on the proper side of the bladder which is normal, with the single exception of the absence of the left ureteral opening. There is no urachus or remains of one, the urethra is patent and the urine

from the single kidney evidently found its way to the amniotic cavity unimpeded.

By exclusion, therefore, one may hypothecate an accumulation within the peritoneal cavity. The position of the remains of the diaphragm suggests that this ascites occurred relatively late, at least after the migration of that structure into its normal position. The normal condition of the upper portion of the spinal column and its abrupt bend backwards also suggests a relatively late accumulation. The absence of the vitelline duct and of a Meckel's diverticulum strongly suggest that the difficulty arose after the intestine had become separated. No trace of its remains could be found in the cord.

The ventral body wall forms at about the twenty-fifth to the thirtieth somite period, i.e., the fourth week. The yolk stalk has already formed and the gut closed off at this time. The splanchnopleure reaches the edges of the belly stalk at about the thirtieth to the thirty-fifth somite stage. The presence of a membrana reuniens replacing a large portion of the ventral wall indicates interference with local development between the time that the gut is closed and that at which the cord is formed, hence about the sixth week.

The absence of any tributary of the thoracic duct below the diaphragm may well explain the accumulation in the abdominal cavity of a quantity of fluid normally drained away through the lymphatic channels. There was no edema of the legs, hence it may be assumed that the lymph from those regions reached and was retained within the peritoneal cavity.

The absence of any pressure surfaces on any of the organs suggests that the fluid accumulated early enough to prevent their production and that it persisted perhaps until the end of pregnancy. It could not be determined at the time of delivery that there was any fluid in the abdomen because of the placenta previa which demanded version and extraction. The abnormal condition was not suspected until the child appeared.

The absence of various organs and the rudimentary condition of others can be attributed in a general way to pressure which would either prevent their formation or cause their "anlage" to disappear. The fact that the missing organs, particularly those which are paired, are not from the same side, is not easy to understand. The absence of the corresponding branches of the abdominal aorta, as noted above, would be expected. The fundamental nature of the disturbance is, however, emphasized by the fact that the umbilical artery is single in the abdomen and is a direct continuation of the aorta. The tendency for the formation of two is shown by the branching within the cord, one of the branches being much reduced in size. Complete absence of an umbilical artery is a common finding in monsters, espe-

cially those with large abdominal defects in which the herniation is not in the midline.

Partial rotation of the lower portion of the body is sometimes observed in various types of malformations, but abrupt angulation of the spine is unusual. Not more than a half-dozen are reported in the literature cited in the bibliography. The absence of the *left* kidney, i.e., on the side away from which the pelvis rotated, might be explained on the basis of a lesion in the spinal column, whether this defect is primary or secondary. The primary (wolffian) duct should connect with the cloaca at the twenty-fifth to thirtieth somite stage (fourth week). Abnormal relations at or before this time would probably prevent this union and lead to atrophy and disappearance of the corresponding kidney and ureter.

The probable position within the uterus associated with the abnormal placentation and a short cord would suggest that a possible rotation and angulation would be increased rather than decreased by the more or less transverse position necessarily assumed by the fetus. There are very few reports of monsters similar to this which have been found in placenta previa (eleven or twelve in all), hence assistance on this point from the literature is not available.

It is not at all uncommon to find the body of very young embryos showing a more or less spiral or serpentine form, suggesting that even under supposedly normal conditions the body does not develop exactly equally. If there were a replacement of the normal ventral curvature of the spine in the tail end by a backward angulation or bending, the later development would tend to increase this deformity. The legs would grow in any direction in which there would be encountered the least resistance, and the pelvic deformity would tend to increase. Muscles would assume new and abnormal relations to bones and to each other, and bones would be molded in form to suit the posture. Clubbed feet would indicate that the extremities had reached the available limit for longitudinal growth or had suffered from some interference with their vascular supply. (The iliacs in this case were extremely small.) When the legs are folded against the ventral surface of the body the pelvis would develop in the natural way, but when bent backwards the symphysis would tend to separate and in extreme cases the rami would turn backwards with an abortive tendency to develop a pelvic cavity behind the sacrum instead of in front of it. The condition called pelvis inversa would be the result. If the process is still more marked and the ribs and abdominal walls also turn back, the so-called schistosoma reflexum is produced. This has been observed in calves on several occasions (von Fingerhuth,[15] Gurlt,[16] Halperin,[17] Lucae[18]), and an incomplete case in a human fetus has been reported by Zander.[19]

There are very few cases on record in which the malformation is

as extensive as in the one described. Marked deformity of the spine, specially retroflexion or acute angulation, is usually, but not always, associated with extensive abdominal wall defects. The converse of this statement is not so universally observed. Even cases of complete abdominal fissure, involving the urogenital system, may have no noticeable spinal deformity and no anomaly of the pelvis other than a split symphysis pubis.

There is a very intangible factor which is recognized as being involved in development, but which is difficult to demonstrate or measure. Note was made above of the relations between the rectal wall and its muscular sheath. In the lower portion this is intimate, but farther up the two are quite separate. This suggests that the "developmental thrust" which produces the muscular sheath continued until its force had been exhausted or had been inhibited by some intercurrent condition. The edge was thus left free and unattached. The same might be said of the skin of the abdominal wall. Here it has grown forward, accompanied by its blood supply, until its force has been expended and there it came to an abrupt end, the transformation of the primitive membrane remaining incomplete. The presence of some form of internal pressure, presumably that of fluid accumulation, appears to be the most likely cause of such a condition of suspended activity of otherwise normally growing tissues.

## SUMMARY

1) A case illustrating multiple fetal malformations is reported, with full pathologic studies, which is not duplicated in literature. The chief points of interest are as follows:

A. Normal apparently full-term development of the upper half of the body.

B. Absence of most of the anterior abdominal wall, its place being taken by a membrana reuniens.

C. Abrupt termination of a relatively straight and normal spinal column at the lumbosacral junction with acute angulation, and lateral displacement of the deformed sacrum.

D. Backward displacement and deformity of the pelvic girdle, (pelvis inversa).

E. Partial rotation and backward displacement of the buttocks, with extension of the legs up toward the occiput.

F. Absence of one of certain paired organs and the rudimentary development of others, not all on the same side of the body.

G. Hypoplasia of the thoracic duct.

H. Practically complete development of the female generative tract from one müllerian duct, the other being rudimentary and widely separated.

I. Complete development of the urinary system except for one kidney and its ureter.

J. Persistent cloaca (failure of development of the uro-rectal septum).

K. Association of a major form of fetal anomaly with placenta previa centralis.

2) A theory is proposed to account for many or all of the anomalies, based upon an assumed congenital ascites due to a disturbance of fluid distribution occurring during growth, thus emphasizing a much neglected factor capable of producing extensive alterations in fetal form and function. The incomplete development of the thoracic duct is possibly a contributing factor.

3) An extensive bibliography has been prepared, giving all references to similar major malformations which could be found in literature, together with a brief summary of the principal findings when not mentioned in the title, and a letter indicating the library in which each has been found.

*Specimen.* This monster has been placed in the museum of the Department of Pathology, University of Chicago, Chicago, Illinois.

*Acknowledgments.* It is with pleasure that the friendly criticism and assistance of Profs. H. G. Wells, and G. W. Bartelmez are acknowledged.

## BIBLIOGRAPHY

The search through the literature has involved so much time and effort, and there are so many gross errors in the citation of authors that it has seemed wise to compile a rather voluminous bibliography for the benefit of those why may desire to correlate these anomalies with those later observed or with the results of experimental embryology involving defects comparable with them. Many titles are either incomplete or totally misleading and where these have been cited a word of explanation of the findings has been given. The defects presented by the case here reported include so many varieties that an attempt to cover them all would involve a summary of almost the whole of the literature on teratology. The following groups of malformations have, therefore, been for the most part omitted; minor abdominal defects as umbilical and ventral hernia, weakness of the abdominal wall, ectopia vesicae, simple spina bifida, minor spinal and pelvic defects, especially in surviving children, and miscellaneous visceral malformations, involving single organs or groups of structures unless these were associated with the major defects specifically discussed. At the end of the bibliography there have been mentioned a few of the more important articles referring to associated anomalies where critical discussions are given or where there is an extensive bibliography included.

As an additional aid to the later investigator the library in which each reference has been found is indicated by an initial letter, search having been made in the order given. (Chu) Harper Library, including the Biology Library, University of Chicago; (Chc), John Crerar Library, Chicago, Illinois; (Wm), Surgeon General's Library, Washington, D. C.

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Jester, K.: Eine Frucht mit Hirnbruch, Bauchbruch und amniotischen Verwachsungen, Inaug. Diss., Königsberg, 1892, 27 pp., 1 pl. (Wm). Placenta adherent to skull, eventration, torsion of spine, etc.

Jewett, G.: Monstrosity, Brooklyn Med. Jour., 1897, xi, 132-7. (Chc). Right leg, and half of pelvis missing. R. L. Dickinson cites a similar case, not published, in museum of college.

Joachimsthal, G.: Ektopia vesicae, combinirt mit anderen Verbildungen, Deutch. med. Wchnschr., April 28, 1898, No. 12, p. 74-5, 1 fig. (Chu). Split symphysis.

Johnson, D.: Report of Case of Deformed Fetus with Placenta Adherent to It, Intestines Uncovered and Presenting, with Description of Delivery, Tr. Obst. Soc. Lond., 1871, xiii, 53-4. (Chu).

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Karpeles: Ein Fall von Eventration, Inaug. Diss., München., 1893, 15 pp.

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von Klein: Beschreibung eines seltenen missgestalteten Kindes ohne Bedeckung der Unterleibs-Eingeweide, Meckel's Deutsch. Arch. f. d. Physiol., 1817, iii, 391-5, 1 pl. (Chu). Complete eventration, left foot missing, and part of pelvis. Scoliosis.

Knauf, G.: Ueber einen Fall von Bauch-Blasen-Genitalspalte, Inaug. Diss., München, 1904, 36 pp, 2 pl. (Wm). Split pelvis, lordosis, scoliosis.

Koch, M.: Multiple Hemmungs—und Defektbildungen bei einem neugeborenen Kinde, Virchow's Arch., 1909, cxevi, 207, 2 figs., 3 text figs. (Chu). Externally relatively normal, pelvis much deformed, etc.

Koeheim, W.: Zur Pathologie der Eventration und mehrerer anderen Missbildungen, Inaug. Diss., Breslau, 1914, 33 pp., 1 pl. (Wm). Pelvic and spinal deformity.

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Krumrey, A. F. K.: Ein Fall von Encephalocele, Hiatus thoracis et abdominis lateralis mit Ektopie der Eingeweide und anderen Missbildungen in Folge von amniotischen Verwachsungen, Inaug. Diss., Griefswald, 1893, 34 pp. (Wm).

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Lamb, D. S.: Malformations and monstrosities in the Army Medical Museum, Mil. Surgeon, 1911, xxix, 374-400. (Chc). Describes 11 cases of abd. defect, eventration, etc.

Läwen, A.: Ueber einen Fall von kongenitaler Wirbel-Bauch-Blasen-Genital und Darmspalte mit Verdoppelung des Cöcums und des Wurmfortsatzes, Beitr. z. path. Anat. u. z. allg. Path., 1912-13, lv, 575-94, 1 pl., 2 text figs. (Chu). Symphysis split.

Leavitt, F.: Case of Congenital Eventration; Fetus Born Dead at Seventh Month, Northwestern Lancet, Minneapolis, 1902, n. s., xxii, 319, 1 fig. (Chc).

Lewis, H. F.: Gastroschesis, Surg., Gynec. and Obst., 1921, xxxiii, 193-4. (Chu). Placenta previa marginalis, retroflexion, evisceration. Another case mentioned with split symphysis, small abd. defect.

Lichtenstein, M.: Ueber einen Fall von angeborener Bauchspalte, Inaug. Diss., München, 1913, 27 pp. (Wm). Details of 7 cases, only last of which is of special interest. Placenta previa, eventration, spinal deformity.

Lockwood, C. B.: Retroflexion of an Early Human Embryo Associated with Absence of the Spinal Medulla and Imperfection of the Vertebral Column, Trans. Obst. Soc. Lond., 1887, xxix, 234-43, 7 figs. (Chu).

Lowne, B. T.: Descriptive Catalogue of the Teratological Series in the Museum of the Royal College of Surgeons of England, Animal malformations, by B. T. Lowne, London, 1893. (Chu). cf. cases 324-340. Spinal curvatures, subclass 1, 2, with ectopia of the viscera. Also p. 83, subclass III, group I, and p. 86, group II. Defective development of somatopleural laminae, thoracic, abdominal and neural.

Macmahon, J. R.: An Embryological Curiosity, Lancet, Lond., 1898, ii, 686-7. (Chu). Eventration, scoliosis, semicloaca, oligohydramnion.

Magid, O. M.: Ectropion of Abdominal Viscera, Am. Jour. Obst. and Gynec., 1921-2, ii, 446-7. 3 figs. (Chu). Retroflexion, pelvic defect, etc.

Magnussen, P.: Beiträge zur Casuistik der Bauch-Blasen-Schambeinspalte mit Eventration, Inaug. Diss., Berlin, Mar. 1, 1886, 43 pp. (Wm). 3 cases with spinal, pelvic, and abd. wall defects.

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Martland, H. S.: Case of Imperfect Closure of the Ventral Abdominal Wall. Jour. Med. Soc. New Jersey, 1909-10. vi, 304-5. (Chc).

Matzdoff, E.: Ein seltener Fall von Missbildung, Inaug. Diss., Berlin, 1887. (Chu). Retroflexion, scoliosis, marked pelvic deformity, eventration.

Maygrier: Monstre celosomien, du genre pleurosome; atrophie du membre superieur droit. Hydrocephalie et malformations de la face. Commencement d'amputation congenitale de deux orteils. Anomalie du cordon ombilical; brides amniotiques. Hydramnios, Bull. Soc. d'obst. de Par., 1898, i, 19-28. 1 pl. (Wm).

Mayne, R. G.: Provinc. Med. Jour., No. 177, 1844. Abstr. Schmidt's Jahrb., 1844, xliii, 50, under title "Fall von Wassersucht der Nabelschnur mit Bildungshemmung." Abdominal defect, absence of diaphragm, scoliosis, compression of thorax. (Chc).

Mezger, G.: Beschreibung einiger Missbildungen mit Störung des Körperverschlusses, Inaug. Diss., Strassburg, 1911. 29 pp. 5 text figs. (Chu). 5 cases, all with eventration, or spinal and pelvic deformity, or both.

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Montgomery, W. F.: Case in Which the Whole of One Lower Extremity and the Side of the Pelvis Were Deficient at Birth, Owing to Cohesion of the Placenta with the Body of the Child, Dublin Jour. Med. Sc., 1855, xxi, 257-64, 1 fig. (Chc). Describes 2 cases conforming to title.

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Myschkin, M. M.: Zur Lehre von der Zwillingsschwangerschaft und von der Entstehung der angebornen Missbildungen, Part II, Monstrum humanum kyphoscolioticum cum spina bifida consecutivisque abdominis hiatu completo et genitalium extremitatumque, Virchow's Arch., 1887, cviii, 133-64, 3 fig. (Chu). Also in Trudi Obsh. Russk. Vrach, v, S. Petersb., (1885-6) 1888, liii, 56-61. (Wm). Under longer Latin title giving further details. Bending of upper part of spine and absence of lower portion. No legs or pelvis, abd. wall missing.

Napier, L.: Foetus at Seven Months Illustrating Celosoma with Retroflexion, Meningocele, and Talipes Varus, Tr. Obst. Soc. Lond., 1894, xxxvi, 116, and 302-6. (Chc). Latter reference is report of committee appointed to study case.

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Oehler; Eine seltene Missbildung im Abdominalbereich, Charité-Ann., Berlin, 1909, xxxiii, 433-9. (Chc). Lateral eventration.

O'Farrell, M. Z.: Niña nacida con eventración de los organos abdominalis, Semana méd., Buenos Aires, 1903, x, 815-6, 1 fig. (Chc). Eventration, no mention made of spine or pelvis.

Opitz: Demonstration of Case Before Society, Centralbl. f. Gynäk. 1899, xxiii, No. 19, 572. (Chc). Placenta attached directly to body, split bladder and pelvis, legs in abnormal positions.

Orihuela, R. M.: Curioso ejemplar de un monstruo teratosomo a tipo celosomiano con espina bifida, Rev. de med. y ciruj. de la Habana, 1918, xxiii, 559-62. (Chc). Eventration, no mention of any pelvic deformity and not shown in 2 figs.

des Ormeaux, V.: Enfant monstre celosomien aspalosome, Gaz. med. de Nantes, 2 s., 1913, xxxi, 272-5. (Chu). Complete eventration, etc.

Otte, A.: Uber Spaltungsmissbildungen am unteren Korperende, Gynäk. Rundschau, 1907, i, 105-11, 2 figs. (Chc). Scoliosis, split symphysis, eventration.

Otto, A. G.: Monstrorum sexcentorum descriptio anatomica, Vratislaviae, 1841, 335 pp., 30 pl., Latin text. (Chu). Cases of eventration figured in Pl. IX, 3, XI, 1 and 2, XII, 1 and 2.

Parson, E.: A Case of Twin Pregnancy Occurring Two Years After Ovariotomy; Attended with Abnormal Development of One of the Children, Lancet, London, Mar. 17, 1866, i, 284-5, 2 figs. (Chc). Eventration, retroflexion, spina bifida, etc.

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Philipeaux, J. M.: Note sur un foetus monstreaux a eventration complete, du sexe feminin, Gaz. méd. de Par., 4th ser., Mar. 15, 1873, ii, No. 11, 146. (Chc). Placenta adherent to abdomen, scoliosis, spina bifida, atrophic right leg, etc.

Pollack, M.: Kombination von Spina bifida, Kloakenmissbildung und Eventration an einer und derselben Frucht, Inaug. Diss., München, 1914, 28 pp., 1 fig. (Chu). Retroflexion.

Ramsay, S.: Communication, Northwest Med. and Surg. Jour., 1857, n.s., vi, 449-50. (Wm). Entire abd. wall missing.

Raybaud, and Bruneau: Note d'autopsie sur un monstre celosomien, Marseille méd., 1902, xxxix, 438-9. (Wm).

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Reil: Merkwürdige Missbildung, Illustr. med. Zeitung, 1853, iii, 83-92, 4 figs. (Chc). Eventration, left arm attached in groin, scoliosis.

Remfrey, L.: Remarks on Fetal Retroflexion: Report of a Specimen Showing Origin of Gluteus Maximus from Occipital Bone, Tr. Obst. Soc. Lond., 1894, xxxvi, 227-37. (Chc). Figures. Bending in cervical region.

Rischpler, A.: Über drei Fälle von Eventration, Inaug. Diss., Marburg, 1898, 43 pp., 1 pl., 2 figs. (Wm). Also in Arch. f. Entwcklngs. mechn. d. Organ., 1898, vi, 556-96, 1 pl. (Chu). Spinal curvature, vascular anomalies.

Roe, C. D.: A Remarkable Case, Lancet, London, 1889, i, 324-5. (Chc). Complete eventration, diaphragm absent, atresia ani, scoliosis.

Root, E. H.: Celosomus, Variety, Schistosomes, Recovery, Tr. Chicago Path. Soc., (1894-5) 1896, i, 247-52. (Chu).

Rose, E.: Ueber das Offenbleiben der Blasen, Monatschr. f. Geburtsk. u. Frauenkr., 1865, xxvi, 244-72, 3 figs. (Chc). Pelvis deformed.

Rosenhaupt, H.: Eine seltene Missbildung, Bauchblasenschambeinspalte mit Beteiligung des Darmes, Verlagerung einer Niere, Fehlen der rechten Nabelarterie und Uterus separatus duplex, Arch. f. Kinderh., 1905, xli, 361-9. (Chu). Split symphysis.

Routh, A.: Foetus with Hernia Umbilicalis Congentia, and Spina Bifida Lumbosacralis, Tr. Obst. Soc. Lond., 1893, xxxv, 102-6, (Chc). Report of committee appointed to examine specimen, shown to society in previous year (ibid., 1892, xxxiv, 463). Ectopia viscerum, retroflexion, pelvic deformity, etc.

Russo, V.: Di un feto mostruoso con fessura abdominale ed ernia di tutto il pacchetto intestinale, Arte ostet., Milano, 1916, xxv, 241-5. (Chu). Eventration, no mention of pelvic deformity.

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Sacré, J.: Description d'un monstre agenosome, Ann. de la Soc. anat.-path. de Brux., 1861, iv, 28-31. (Wm).

Schaefer, P.: Descriptio anatomico-pathologica monstri cum eventratione, Inaug. Diss., Bonnae, 1837, 22 pp., 2 pl. (Wm). Absence of right leg and half of pelvis. Bibliogr.

Schaller: Multiple Missbildung mit totalen Defekt der Nabelschnur, Med. Cor.-Bl. d. württemb. ärztl. Landesver., Stuttg., 1906, lxxvi, 953-5. (Chu). Torsion of body, no cord, arms absent or rudimentary, etc.

Schenck, S. B.: A Case of Gastroschesis, Perforate Diaphragm, Anorchidy, Cloaca, Absence of Colon and Rectum, Imperforate Anus, Spina Bifida, Spinal Scoliosis, Sacral Lordosis, and Split Pelvis, Am. Jour. Obst., 1919, lxxx, 38-46. (Chc).

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Schwenke, J.: Ueber drei Fälle von Bauchspalte mit verschiedenen Komplikationen, Beitr. z. path. Anat. u. z. allg. Path., 1912, lii, 445-75, 1 pl., 2 text figs. (Chu). Eventration with scoliosis, etc.

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Simons, F. A.: Eventration in Kombination mit verschiedenen anderen Missbildungen, Gynäk. Rundschau, 1914, viii, 354-60. (Chc). Right leg missing, scoliosis, spina bifida, pelvic deformity.

Simpson, A. R.: Dystocia from Exomphalos of the Foetus, Edinburgh Med. Jour., 1881-2, xxvii, 873-8, 1 fig. (Chc). Complete eventration, retroflexion, refers to 14 cases of retroflexion.

Sömmering, S. T.: Abbildungen und Beschreibungen einiger Missgeburten, Mainz, 1791. (Chc). Figures case in Pl. VIII, scoliosis, ventral hernia. Also Pl. X, Fig. 3, large umbilical hernia with cord on side.

Stern, H.: Eine Frucht mit Eventration und mehreren anderen Missbildungen, Inaug. Diss., Königsberg, 1896, 17 pp., 1 pl. (Wm). Left leg rudimentary.

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Sternberg, C.: Title as above. Centralbl. f. allg. Path. u. path. Anat., Feb. 15, 1911, xxii, No. 3, 101-6, 2 figs. (Chu).

Strassmann, P.: Missbildung mit grossem Bauchbruch. Fehlen der Nabelschnur. Prolaps der Placenta, Ztschr. f. Geburtsh. u. Gynäk., 1895, xxxi, 178-80, Pl. VII-IX. (Chc). Placenta previa centralis, hyperlordosis, eventration.

Struve, P. F. W.: Eine Frucht mit Eventration und mehreren anderen Missbildungen, Inaug. Diss., Königsberg, 1897, 1 fig. (Chu). Lordosis, scoliosis.

Stute: Fall von Placenta praevia mit totalem Fehlen der Nabelschnur, Monatschr. f. Geburtsk. u. Frauenkr., 1856, vii, No. 1, 36-8. (Wm). Complete eventration, placenta attached to abd. wall, spina bifida.

Taglicht, F.: Ein Fall von zahlreichen Missbildungen bei einer totgebornen Frucht, Virchow's Arch., 1920, cexxix, 303-36, 1 fig. (Chu). Scoliosis, pelvic deformity, eventration.

Tänzer: Case Report (no title), Ztschr. f. Geburtsch. u. Gynäk., xiv, 249. Reported to Gesellsch. f. Geburtsh. u. Gynäk. z. Berlin. Dec. 10, 1886. (Wm). Complete ectopia, retroflexion.

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Tourneux, F., and Wertheimer, E.: Description d'un monstre célosomien avec spina bifida (Hydrorachis interne), Jour. de l'anat. et physiol., etc., Par., 1882, xviii, 578-87. (Wm).

Ulrich, G. L.: Deformationem foetus humani rariorem describens, Inaug. Diss., Marburg, 1833, 16 pp. (Wm). Abd. fissure.

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Van Deusen, E. H.: Monstrosity by Defect; Abdominal Walls and Diaphragm Absent, Tr. Homeop. Med. Soc. Penn., (1890) 1891, xxvi, 149-52. (Chu). Rotation of spine and sharp retroflexion.

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Vrolik, W.: Tabulae ad illustrandam embryogenes in hominis et mammalium, tam naturalem quam abnormem, 1854, Lipsiae, 224 pp., 100 pl. T. O. Weigel. (Wm). (not seen) (Latin and German title pages, Latin and Dutch text). Retroflexion of trunk, Pl. 21 and 22.

Wedl, C.: Bauchspalte eines sechsmonatlichen menschlichen Fötus, Ztschr. d.k.k. Gesellsch. d. Aerzte in Wien. Med. Jahrbücher, 19th year, 1863, i, 143-8. (Wm).

Wertheim, C. C.: Vollständiger Mangel des Kreuz-und Steissbeins bei einem Neugebornen, Monatschr. f. Geburtsk. u. Frauenkr., 1857, ix, 127-31. (Chc). Spine ends with last lumbar vert. Cystic tumor replaces sacrum.

White, C.: The Pelvis with Congenital Absence of the Sacrum, Jour. Obst. and Gynec. Brit. Emp. Lond., 1911, xix, 478-81, 2 pl. (Chc).

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von Woerz, H.: Eine Missbildung mit Amnionnabel, Ektopie der Blase, Symphysenspalte und Spina bifida, Zentralbl. f. Gynäk., 1894, xviii, 14-7. (Chc).

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PLACENTA PREVIA ASSOCIATED WITH MAJOR FETAL ANOMALIES

See articles by Breus, Commiskey, Genova, Hein, Hertzfeld, Klautsch, Lewis, Lichtenstein, Strassmann, Stute, Voron and Grivet, as cited above. Also,

Greenhill, J. P.: The Association of Foetal Monstrosities and Deformities with Placenta Previa, Surg., Gynec. and Obst., 1923, xxxvi, 227-31. (Chu).

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SPONDYLOLISTHESIS

Neugebauer, F. L.: Spondylolisthesis et Spondyl-Izeme, Par., 1892. English Tr. by New Sydenham Society, 1888, cxxi, 64 pp. (Chc). Cases in later life, many figures, attempts compilation of all on record.

Neugebauer, F. L.: Bericht über die neueste Kasuistik und Literature der Spondylolisthesis, mit einschlagigen Bemerkungen über die Differential Diagnose, Ztschr. f. Geburtsh. u. Gynäk., 1893, xxvii, 348-438, 45 text figs. (Wm). Adds to previous compilation 8 clinical cases and 7 dissections.

Perrone, A.: Ueber kongenitale Skoliose, Ztschr. f. orthop. Chir., 1906, xv, 353-89. (Chc). Critical review and summary.

Schwartz, G.: Ätiologie und Genese der Spondylolisthesis, Inaug. Diss., Strassburg, 1901, 34 pp. (Wm). Bibliogr. Critical discussion.

Taylor, J. M., and Winsor, H.: A Collective Review of the Literature of Spondylopathology, in their A Study of Sympathetic and Vasomotor Pathology, etc., Philadelphia, 1922. (Chu). cf. pp. 9-21. Correlation of congenital anomalies with visceral and other disease.

SPINA BIFIDA

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# APPLICATION OF THE FORCEPS TO THE TRANSVERSE HEAD FOR DELIVERY OF PERSISTENT OCCIPITOPOSTERIOR CASES*

By Hervey C. Williamson, M.D., New York, N. Y.

WE are all aware of the frequency of the occipitoposterior position and to many, its management is something of a *bête noir*. Labor with the head in this position often results in premature rupture of the membranes, long delay in the dilatation of the cervix and secondary inertia before rotation occurs. As the baby's back extends to accommodate itself to the posterior part of the flattened uterine ovoid, deflection of the head takes place. The syncipital and occipital ends of the head, lever, balance with the head in half extension as soon as the contractions force it against the cervix or the pelvis. This leads to the passage of the occipitofrontal diameter of the head through the pelvic cavity with consequent delay.

If secondary inertia develops, the labor should usually be terminated. At this time the head is generally unrotated and in midpelvis, with the cervix not completely dilated.

*Read at a meeting of the New York Obstetrical Society, May 12, 1925.

There are four methods of terminating the labor. The first is by external manual rotation of the shoulders at the same time that the occiput is lifted forward by vaginal manipulation. The patient may then be allowed to deliver spontaneously or forceps may be applied to the head in the anterior position. The difficulties attending the success of this procedure are great and the head usually returns to its original position.

The second method is version and may be used if the head is unengaged or lying in the inlet of the pelvis. Before electing this operation, one must make certain that the pelvis is not contracted and that

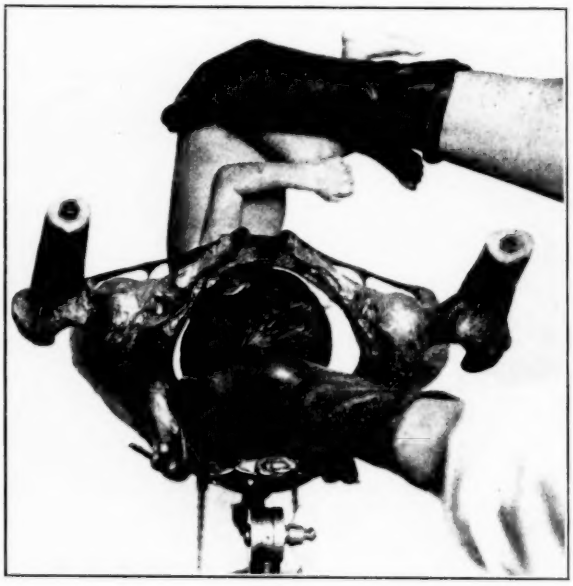

Fig. 1.—Rotation of the head to the transverse position.

the lower uterine segment is not unduly thin. As a rule version is not to be performed after unsuccessful attempts at delivery by forceps because of the danger of rupture of the uterus.

The third method consists of the application of forceps to the head in the occipitoposterior position, with traction and rotation. Reapplication of the forceps is made when the head is in the anterior position. This double application is known as the Scanzoni procedure. In 1915 it was modified by Bill who applied the forceps to the head in the posterior position and then raised the handles so that flexion was secured. This left the well-molded, nearly round occiput to be rotated by swinging the forceps handles in an arc. Under these conditions rotation is almost instantaneous because there is practically no re-

sistance to overcome if the head be in midpelvis. After rotation and slight traction the forceps is reapplied.

The fourth method, which I wish now to describe, has the advantage of requiring but a single application of the forceps. It is a combination of manual rotation of the head to a transverse position and the application of the forceps with the posterior blade in the hollow of the sacrum and the anterior blade under the symphysis. The blades thus face the occiput so that reapplication is not necessary.

### TECHNIC

It has been found that the best instrument for this and other midpelvic work is an Elliott forceps. The model that we use differs from the instrument generally sold in having a longer shank, better head

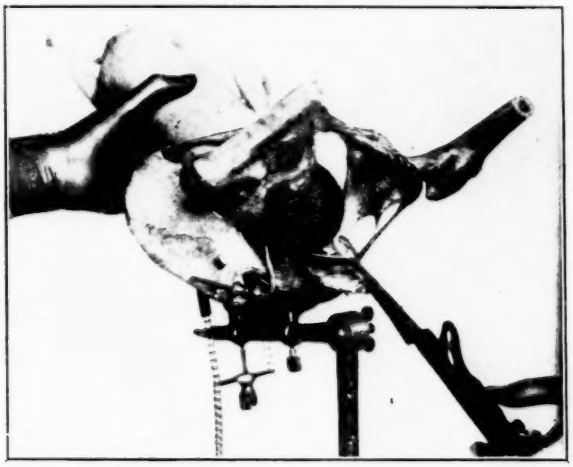

Fig. 2.—Introduction of the posterior blade of the forceps.

curve, and wider opening at the tips. The measurements are: 39 cm. total length; 10 cm. length of shank; 8 cm. between the blades at the maximum of the curve; 3 cm. between the tips; and 8 cm. from a level surface to the summit of the blades.

A positive diagnosis of the position is made by the palpation of an ear with the whole hand in the vagina. If one takes this precaution the head should never be drawn out in a posterior position. The next step is to introduce the proper hand to rotate and hold the head, the left hand in an R.O.P. and the right in an L.O.P. The hand is cupped in such a manner that the fingers are posterior to the head with the occiput lying in the palm. The palm then simulates the levator ani muscle. If this procedure does not rotate the head readily, firm pressure is made with the other hand upon the fundus, thereby forcing rotation on the artificial levator. By this maneuver, flexion is secured

and the head held in the pelvis. This step is the crux of the whole procedure.

With the head in the transverse position, the success of the single application of the forceps depends upon the proper technic in the insertion of the blades. In the R.O.P. position, the right blade of the forceps is applied posteriorly and should be introduced first. Without withdrawing the hand which has acted as the levator, the blade is passed in the midline and the handle depressed. This is necessary in order to avoid the promontory and it keeps the blade in close apposition to the head. The hand being now withdrawn, the blade will hold the head in the transverse position. The second blade (left) is now introduced along the side of the pelvis and rotated into position. The technic is important as the blade has to pass over the baby's

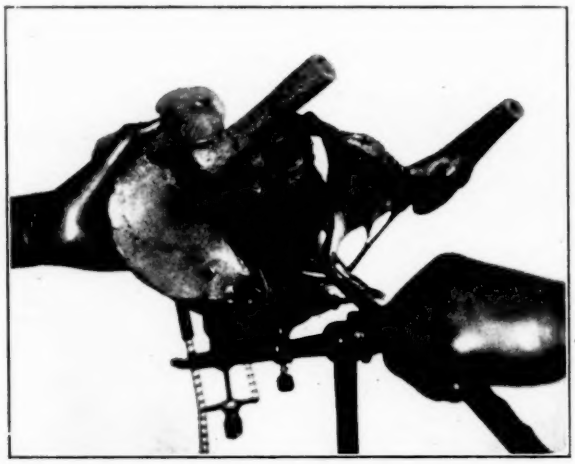

Fig. 3.—The anterior blade introduced along the side of the pelvis.

face. Its placing will be facilitated by depressing the handle, which will then cause the blade to slide with the utmost ease forward beneath the symphysis to the biparietal diameter of the head. Inasmuch as the right blade was introduced first it will be necessary to cross the handles before they can be locked; this is easily accomplished. In the L.O.P. position the left blade, as usual, is first introduced. The technic is the same as described for the R.O.P. except that the handles do not have to be crossed.

The interesting feature of this procedure is now apparent, namely, that in many cases when the forceps is locked, the head instantly rotates to the anterior position. In those cases in which it does not, only slight rotation is necessary to accomplish this result. Rotation must always be completed before traction is made. Under these conditions there is no danger to the soft tissues.

The delivery is then made as in any other anterior position. For

the midpelvic operations episiotomy will often help before traction as it gives, unconsciously to the operator, a better direction of pull. The incision should be made from the center of the fourchette to a point midway between the anus and the tuberosity of the ischium (mediolateral), thereby avoiding all danger to the sphincter.

The single application of the forceps has been used in a few cases of high forceps with good results. It may be better in the high forceps operation to draw the head to midpelvis in the posterior position after which the technic just described can be followed. There are two conditions in which this method is not advised. If the head is well

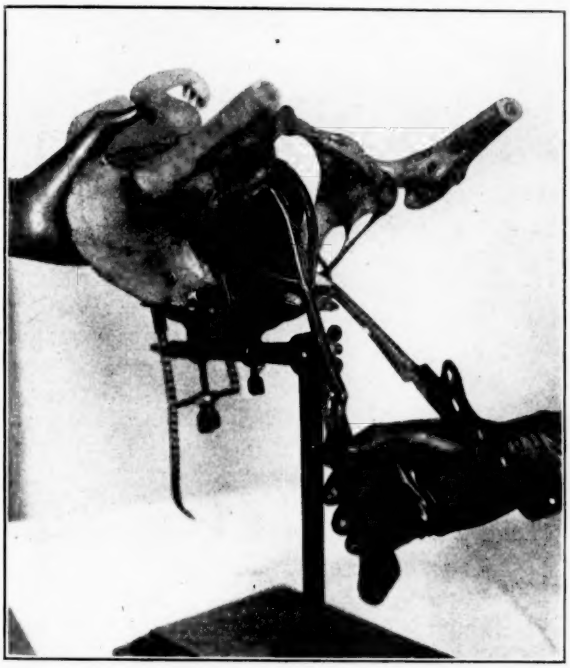

Fig. 4.—The anterior blade is rotated into position.

on the perineum in a posterior position, a rare occurrence in a primipara, it is usually better to draw it out in that position than to attempt 180 degrees of rotation. In a funnel pelvis, if the head is deeply placed in a posterior position, it is often better to extract in that position as the ischii converge and the bulkier part of the head is allowed to escape in the posterior triangle which is bounded laterally by soft tissue.

## STATISTICS

One hundred mid- and high forceps cases treated by this technic are reported. They are as follows: Thirty-nine from the Second Obstetrical Division of Bellevue Hospital, 23 from the Manhattan Maternity and Dispensary, and 38 from private and consultation cases. At

Bellevue Hospital and at Manhattan Maternity these operations were performed either by me or by members of the staff who follow this technic.

| FORCEPS: | HIGH | MID A. | MID B. | MID (Unclassified probably B.) |
|---|---|---|---|---|
| Bellevue | 12 | 12 | 11 | 4 |
| Manhattan | 0 | 5 | 9 | 9 |
| Private | 1 | 28 | 9 | 0 |
| Totals | 13 | 45 | 29 | 13 |

At Bellevue Hospital there were no maternal deaths and no stillbirths. One baby of 3890 grams died on the fifth day with meningeal symptoms. One of the babies had signs of intracranial hemorrhage but recovered. Five babies had facial paralysis which promptly

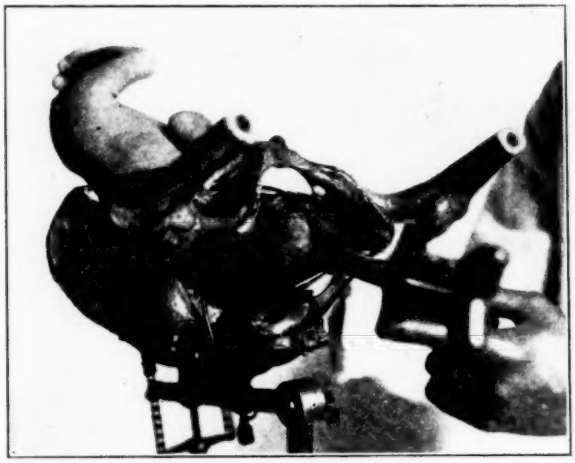

Fig. 5.—The forceps in position.

cleared up. In two of the high forceps cases the single application was made after the head was drawn up into the pelvis.

At Manhattan Maternity and Dispensary there was no stillbirth due to the forceps procedure and but one neonatal death. This was a child of 2750 gm. who died on the twenty-ninth day, of cerebral hemorrhage. There was one stillbirth due to an occult prolapsed cord and one neonatal death due to an imperforate anus.

At this institution one mother died. This patient was forty-one hours in labor. A median B forceps operation was done for a deep transversely placed head. A living 3825 gm. baby was delivered with difficulty. The patient went into a shock and died later that day. The autopsy showed a degeneration in a small area of the wall on either side of the lower uterine segment, and sections of this area revealed an infected, hemorrhagic necrotic process with an opening into the abdominal cavity on the left side, the size of a dime. Apparently this perforation was due to pressure necrosis.

In the private and consultation cases there was no maternal death. There were four stillbirths but none could be attributed directly to this maneuver. In the first no fetal heart sound was heard before delivery; in the second the head was easily extracted but shoulder delivery was very difficult, the baby weighed 4500 grams; the third was seen in consultation and the family physician had given 3 c.c. of pituitrin at intervals before the operation, which was very easy; the fourth occurred in an eclamptic patient on whom labor was induced. In the entire series there were five stillbirths and three neonatal deaths. One of the stillbirths and two of the neonatal deaths might be attributed to the forceps operation.

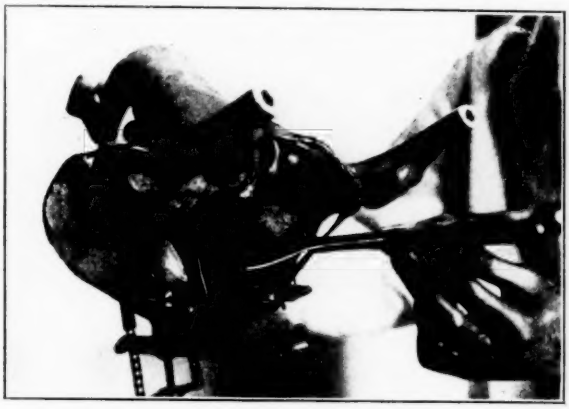

Fig. 6.—Anterior rotation completed.

## SUMMARY

The principle of this procedure is the application of the forceps to the head lying in a transverse position in the pelvis. In the maneuver to deliver the occipitoposterior head by one application of the forceps the hand is introduced into the vagina, the head rotated to the transverse position and the posterior blade of the forceps introduced into the hollow of the sacrum. The second blade is inserted along the sides of the pelvis, the handle depressed and the blade placed on the side of the head beneath the symphysis. The important feature in the introduction of the blades is to depress the handles. Rotation takes place spontaneously in many cases and very easily in the others. It should always be complete before traction is made. Extraction is the same as in any other anterior head position.

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34 East Seventy-fifth Street. (*For discussion see page* 120.)

# HEART OUTPUT DURING PREGNANCY

By H. J. Stander, M.D., E. E. Duncan, M.D., and W. E. Sisson, M.D.,
Baltimore, Md.

*(From the Department of Obstetrics, Johns Hopkins University and Hospital)*

In view of the increase in body weight, in blood volume,[1] and in the size of the uterus during pregnancy, one might suspect that the gravid state is also associated with an increased cardiac output. During the latter part of pregnancy the response to effort becomes restricted, as is evidenced by the appearance of breathlessness upon an exertion which hitherto had been accomplished with ease. However, up to the present no one has adduced direct evidence to show that the heart does more work during pregnancy. In order to gain such information we have studied the cardiac output in animals both in the nonpregnant and pregnant state.

The amount of blood which passes through the lungs in unit time, or the so-called "minute volume," has been directly studied in goats by Barcroft, Boycott, Dunn and Peters.[2] These investigators employed the principle of Fick[3]; later elaborated by Zuntz,[4] according to which

$$\text{M.V.} = \frac{\text{O}}{\text{A} - \text{V}}$$

where M.V. = minute volume; O = total oxygen in c.c. used by the animal per minute; A = the c.c. of oxygen in 1 c.c. of arterial blood; and V = the c.c. of oxygen in 1 c.c. of venous blood.

E. K. Marshall, Jr.,[5] has developed a technic for applying this direct method to the dog. In our experiments we have used dogs exclusively and have followed the technic of Marshall.

*Method.*—In our experiments we have found it necessary for the dog to receive considerable preliminary training so as to accustom it to the several procedures, and to allow us to subject it to various manipulations without manifesting excitement or without visible signs of pain. This is especially necessary for, should the animal become excited and struggle, the results obtained would be valueless. Consequently only well-trained and willing animals can be used. It might be noted that most of our animals behaved so well that it was never necessary to discontinue an experiment with a well-trained dog during the months of observation.

The principle of the method consists in determining the amount of oxygen the animal uses in unit time, and the oxygen content of its arterial and venous blood, respectively. From analyses of the inspired, or room air, and the expired air, one can determine the actual

amount of oxygen used. The expired air is collected for a definite period of time in a Douglas bag, and is measured and analyzed for oxygen and carbon dioxide. The arterial and venous blood samples are taken from the left and right sides of the heart, respectively, and are analyzed for oxygen content in a van Slyke apparatus.

*Apparatus.*—For the breathing part of the experiment we employ a tight fitting mask, which is made of plaster of Paris bandage moulded over the muzzle of the animal, allowed to dry, and then soaked in paraffin in order to render it air-tight. The mask is connected by means of a short rubber tube to a Lovèn valve, the rubber coverings of which are frequently changed. The Lovèn valve communicates through a two-way valve with a twenty-five liter Douglas bag. For measuring the volume of the expired air, we use a three liter wet-

Fig. 1.

meter. The analysis of the expired air is carried out in a Haldane gas analysis apparatus.

To obtain the blood specimens, we puncture the heart with a 3.5 inch, 20-gauge needle. The needle is attached to a 10 c.c. Luer syringe, which contains about 2 c.c, of paraffin oil. The blood sample, as soon as obtained, is transferred to a small bottle containing paraffin oil and a sufficient quantity of oxalate to prevent clotting.

*Technic.*—After all preparations have been made, the dog is placed on a well-padded table and allowed to rest for half an hour. The skin over the point of maximum impulse of the heart is then cleaned and the area anesthetized with 2 per cent procaine. A second area on the right side, corresponding to the P.M.I., but one interspace higher, is similarly treated. The animal is now connected with the breathing apparatus by means of the mask, which is rendered completely air-tight with soft plasticene. The dog is allowed to breathe for about a minute and then the two-way valve is connected with the Douglas bag. The animal now breathes into the bag for, say, four minutes, a

stop watch being used to measure the time. At the end of the breathing period the bag is closed by turning the two-way valve, the mask is disconnected, and the dog turned on its back and held gently while the heart punctures are made. It is not necessary to use any force to keep the well-trained animal in position.

The arterial blood sample is procured by introducing the needle through the skin on the left side of the animal, at the point of maximum impulse, and then pointing it downwards in a line at right angles to the surface. The needle enters the left heart at a depth of about 1.5 inches in the average sized dog. As soon as the needle enters the cavity of the ventricle, the blood is forced up into the syringe at each heart beat.

The area of selection for puncturing the right heart is a point on the right side of the sternum one interspace higher and slightly more lateral than the left puncture point. In this case, the needle is introduced in a slightly caudal direction and towards the left side of the animal. After some experience, one learns to make the punctures

TABLE I

RESULTS OBTAINED FROM NONPREGNANT DOGS

| DOG | DATE | CONDITION | WEIGHT | PULSE | SYSTOLIC OUTPUT | MINUTE VOLUME |
|---|---|---|---|---|---|---|
| No. 1 | 1/13/25 | Normal | 12.4 kg. | 124 | 26.1 c.c. | 3243 c.c. |
| | 1/29/25 | Normal | 11.8 kg. | 112 | 29.2 c.c. | 3269 c.c. |
| | 4/22/25 | Normal | 14.3 kg. | 140 | 22.8 c.c. | 3196 c.c. |
| No. 2 | 1/15/25 | Growing | 9.7 kg. | 160 | 7.9 c.c. | 1271 c.c. |
| | 1/28/25 | Growing | 9.5 kg. | 135 | 8.5 c.c. | 1140 c.c. |
| | 2/24/25 | Growing | 11.3 kg. | 112 | 14.8 c.c. | 1653 c.c. |
| No. 3 | 11/12/24 | Normal | 11.3 kg. | 88 | 14.5 c.c. | 1275 c.c. |
| | 12/23/24 | Normal | 10.9 kg. | 112 | 10.9 c.c. | 1221 c.c. |
| | 1/22/25 | In estrus | 10.6 kg. | 116 | 15.9 c.c. | 1842 c.c. |
| | 1/31/25 | Normal | 10.4 kg. | 100 | 15.4 c.c. | 1540 c.c. |
| No. 4 | 1/14/25 | Normal | 10.9 kg. | 130 | 15.5 c.c. | 2017 c.c. |
| | 2/26/25 | In estrus | 13.4 kg. | 108 | 23.1 c.c. | 2497 c.c. |
| | 10/24/25 | Normal | 11.8 kg. | 100 | 15.0 c.c. | 1502 c.c. |

TABLE II

DOG NO. 5. CONDITION BEFORE, DURING, AND AFTER THE PREGNANT STATE

| DATE | CONDITION | WEIGHT | PULSE | SYSTOLIC OUTPUT | MINUTE VOLUME |
|---|---|---|---|---|---|
| 12/20/24 | Nonpregnant | 17.4 kg. | 104 | 30.7 c.c. | 3193 c.c. |
| 1/ 8/25 | Nonpregnant | 16.8 kg. | 106 | 28.4 c.c. | 3015 c.c. |
| 1/24/25 | Nonpregnant | 17.0 kg. | 94 | 33.3 c.c. | 3135 c.c. |
| 2/12/25 | Nonpregnant | 16.9 kg. | 96 | 29.0 c.c. | 2785 c.c. |
| 2/28/25 | Nonpregnant | 16.8 kg. | 106 | 29.1 c.c. | 3091 c.c. |
| 6/ 2/25 | Pregnant | 19.3 kg. | 130 | 29.6 c.c. | 3844 c.c. |
| 6/15/25 | Pregnant | 19.5 kg. | 104 | 36.4 c.c. | 3784 c.c. |
| 6/19/25 | Pregnant | 20.9 kg. | 104 | 41.7 c.c. | 4341 c.c. |
| 6/24/25 | Pregnant | 21.0 kg. | 120 | 34.7 c.c. | 4165 c.c. |
| 7/11/25 | Puerperal | 17.7 kg. | 100 | 35.1 c.c. | 3514 c.c. |
| 8/ 5/25 | Puerperal | 16.8 kg. | 96 | 34.1 c.c. | 3277 c.c. |
| 9/ 3/25 | Normal | 16.4 kg. | 96 | 31.5 c.c. | 3027 c.c. |
| 10/20/25 | Normal | 19.3 kg. | 102 | 30.1 c.c. | 3072 c.c. |

NOTE: This dog was delivered June 28, 1925, of four young.

TABLE III

DOG NO. 6. CONDITION BEFORE, DURING, AND AFTER THE PREGNANT STATE

| DATE | CONDITION | WEIGHT | PULSE | SYSTOLIC OUTPUT | MINUTE VOLUME |
|---|---|---|---|---|---|
| 2/21/25 | Nonpregnant | 15.0 kg. | 116 | 21.4 c.c. | 2484 c.c. |
| 3/19/25 | Nonpregnant | 16.3 kg. | 100 | 21.2 c.c. | 2117 c.c. |
| 4/ 7/25 | Nonpregnant | 15.9 kg. | 95 | 29.1 c.c. | 2769 c.c. |
| 4/18/25 | Nonpregnant | 16.8 kg. | 104 | 20.8 c.c. | 2166 c.c. |
| 4/20/25 | Nonpregnant | 17.0 kg. | 106 | 26.4 c.c. | 2798 c.c. |
| 10/ 6/25 | Pregnant | 23.7 kg. | 100 | 37.8 c.c. | 3781 c.c. |
| 10/15/25 | Puerperal | 18.0 kg. | 100 | 29.2 c.c. | 2919 c.c. |
| 10/23/25 | Puerperal | 17.4 kg. | 106 | 22.8 c.c. | 2420 c.c. |

NOTE: This dog was delivered October 6, 1925, of nine young.

without difficulty, and feels sure that one has entered the left or right ventricle, as the case may be.

The blood samples are at all times out of contact with the air, and are kept under oil until analyzed. The analyses should be done within twelve hours, as the blood might change in its oxygen content on standing.

*Calculations.*—From the analysis of inspired and expired air, one obtains the percentage of oxygen actually absorbed by the animal. From the total amount of expired air, reduced to standard conditions of pressure and temperature, the percentage of oxygen used and the length of the breathing period, we can determine the volume of oxygen absorbed, or "O" in the equation,

$$\text{M.V.} = \frac{\text{O}}{\text{A-V}}$$

The actual volumes per cent of oxygen in the specimens of arterial and venous blood give us the "A" and "V," respectively, in this equation, while "M.V." is the minute volume.

*Results.*—We have experimented on six well-trained female dogs, four of which remained nonpregnant, while two became pregnant. In Table I we give the results obtained in the first group, while in Tables II and III are shown the values for the two dogs which became pregnant, and the conditions obtaining before, during, and after that state.

The figures for the nonpregnant animals show that the method is dependable, as is evidenced by the fact that the heart output varied very slightly during the entire course of observation. The minute volume has a much more constant value than the systolic output, as already shown by Marshall.

In two of the animals, No. 3 and No. 4, we were able to procure values for the minute volume during the estrus cycle. These indicate that the cardiac output is increased at that time. Marshall, in a personal communication, states that he has obtained similar results in his detailed studies on the estrus cycle and the minute volume in dogs. It is evident that several factors are involved in the problem, and, from our few determinations during the estrus period, we can

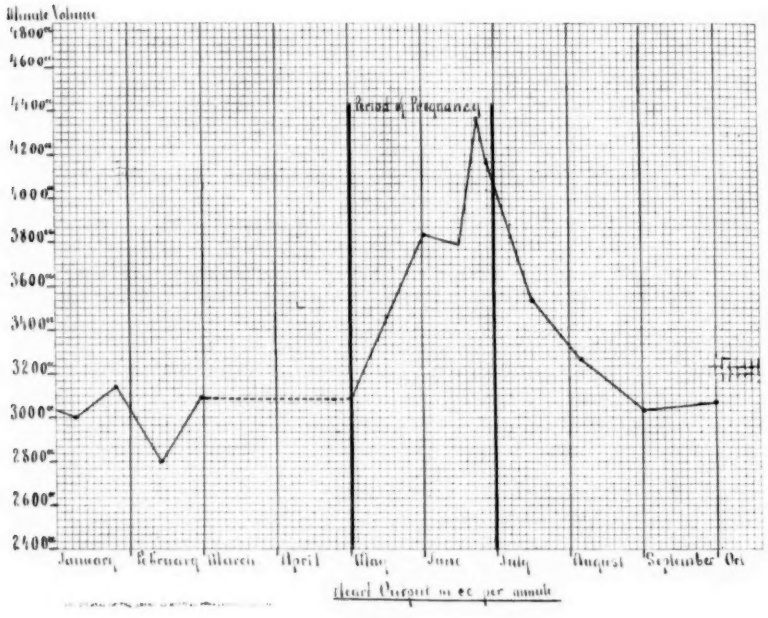


Fig. 2.

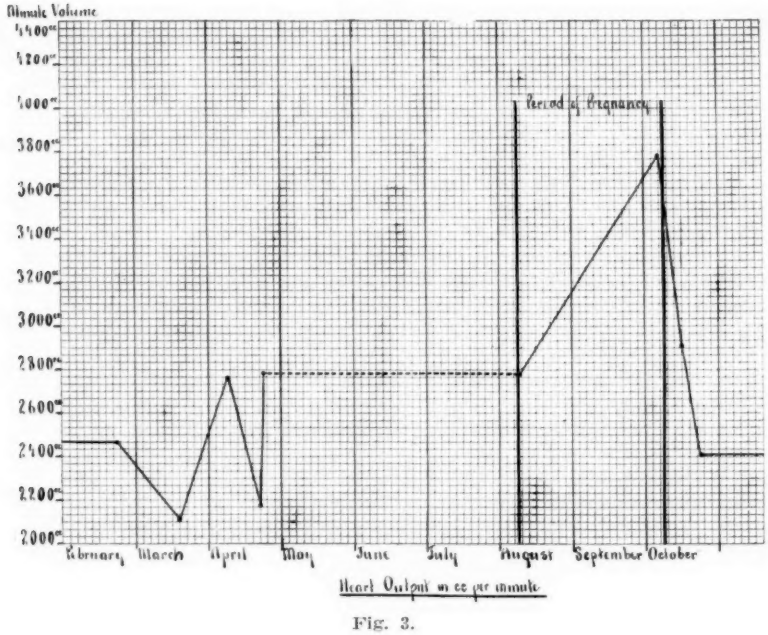


Fig. 3.

only say that there is a definite tendency toward a higher cardiac output.

During pregnancy the results are quite definite and instructive. Dog No. 5 had an average minute volume of 3073 c.c. before preg-

nancy. About one week before delivery her minute volume had risen to 4165 c.c., and within one month after delivery her heart output had fallen to 3277 c.c. per minute. Two determinations made two and three months, respectively, after delivery gave a minute volume of about 3050 c.c. The changes noted in this animal are shown in Fig. 2.

Dog No. 6 shows even more strikingly the increase in cardiac output during pregnancy. Before gestation, her heart pumped 2467 c.c. of blood per minute, but just prior to delivery, and while evidently in labor, the figure rose to 3781 c.c., an increase of 53 per cent. After delivery it gradually dropped, and two weeks later was 2420 c.c. per minute. Fig. 3 records these changes graphically.

## DISCUSSION

Since we have demonstrated that the cardiac output is increased from one-third to one-half during the latter part of pregnancy in the dog, and as we know that pregnancy is not associated with a fall in blood pressure, it becomes apparent that the heart is called upon to perform a greatly increased amount of work. This is undoubtedly due to the uteroplacental circulation, the general increase in body weight, and to such disturbing factors as displacement of the heart and interference with the shape and movements of the chest.[6, 7]

Pregnancy in the dog is associated with a general increase in body weight of about 25 to 50 per cent, depending upon the size of the litter, while in the human we note an increase of only about 20 per cent. Accordingly, it is conceivable that the increase in cardiac work during pregnancy may be somewhat less in women than in dogs.

Whether this additional work is effected by actual hypertrophy of the heart or merely by drawing upon the reserve force of the heart has not yet been decided. Mackenzie believed that no hypertrophy occurs in the normal pregnant woman, while other investigators note a slight increase in size of the heart. However this may be, it is apparent that some mechanism must be called into play to meet the increased demands of pregnancy.

Generally speaking, it would appear that in the normal individual this demand is met without difficulty, but that in those presenting a definite cardiac abnormality, such an added strain cannot be regarded with indifference. In the latter circumstances, it is necessary for us to employ every means at our disposal to evaluate the cardiac reserve force and to determine whether it is sufficient to meet the added demands of pregnancy.

## CONCLUSIONS

1. The minute volume of the heart has a far more constant value than the systolic output.

2. The cardiac output of the nonpregnant dog varies only within slight limits.

3. During pregnancy the minute volume is markedly increased, being one-third to one-half greater than before.

4. Following labor the minute volume gradually falls and regains the nonpregnant value within two to three weeks.

5. During the estrus cycle our studies indicate that changes occur similar to those in pregnancy, but to a slighter degree.

6. Whether the increased output in pregnancy is the result of hypertrophy of the heart, or not, has not been determined, but it appears probable that, at least in part, it is accomplished by drawing upon the reserve force of the heart. For this reason, it would seem that before expressing a prognosis in cases of pregnancy complicated by abnormalities of the heart, one should always attempt to evaluate the reserve force of the heart.

7. A direct method for determining the cardiac output in women would enable us to make an intelligent prognosis in cases of pregnancy complicated by heart disease; but until a suitable method becomes available, we shall have to be content to base our prognosis upon the available clinical data.

We wish to express our appreciation to Prof. E. K. Marshall, Jr., for his suggestions and advice in our investigations and to Dr. C. H. Peckham for valuable help in some of the experiments.

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# STERILITY-FERTILITY STUDIES IN ANIMALS AND THEIR BEARING ON HUMAN PROBLEMS*

By R. L. Dickinson, M.D., New York

*(From the Committee on Maternal Health)*

THE standard textbook, Marshall's *Physiology of Reproduction* (1922), expounds in such detail and perspective, and refers so fully to the literature, that one need only touch on special points among animals in general. Many suggestive investigations are available concerning pedigreed quadrupeds, such as the mare and cow, which have a gestation period like that of woman. They differ from human beings in that they are of such high value that elaborate studies of fertility and sterility pay; they have a fixed date for isolated copulation; they permit the act only a few hours every three weeks; such dates are registered, and, last of all, each patient may come to autopsy. Data thus accessible are rarely presented in human unions.

Do the small ovaries sometimes found in sterile women (with other genital organs normal) necessarily indicate defective ovulation? Not if we are to judge by the cow. Her right ovary measures five-eighths to three-fourths of an inch in diameter. The left is frequently less than one-fourth the volume of the right, but this small ovary functions nearly as actively as its fellow. Williams found, in the abattoir, in 1700 pregnancies, 55 per cent in the right and 45 per cent in the left horn of the uterus. Incidentally we may note that Zschokke, of Zurich, reported that in heifer calves, only 70 per cent of the ovaries were normal; 8 per cent had fibroid and various tumors; others, chronic oophoritis (usually tuberculous), while sclerosis, and persistent corpus luteum were present also. Albrechsen claims that 86 per cent of cure of ovarian inflammation and delayed ovulation is the result of curing infections along the genital tract. F. C. Holden has stressed cervical and other birth canal infections as causes of ovarian disorders, many of which have to do with sterility, but he lacked the Dane's diagnostic advantages. The veterinary can reach every part of the genital apparatus through the thin rectal wall and verify the diseased conditions and the shrinkages that result from cure of infection.

What is the *bearing of persistent corpus luteum* on amenorrhea and sterility?

The lack of absorption of the yellow body is asserted by Zschokke to be due in cattle, to some foreign material in the uterus, such as fetus, retained placenta, or pathologic discharges. Some persistence

*Read before the New York Obstetrical Society, January 13, 1925.

is said to be due to feeding with malt or slop from sugar beet (suggesting our swiftly developing human sugar-fat sterility). Nielsen first expressed the persistent corpus luteum and reported most cases of sterility cured thereby. Persistence is said to be found in 70 per cent of sterilities and, in the worse conditions, to be accompanied by metritis. Albrechsen ignores the corpus itself and focuses his attention on the infection. Therefore in women we may query, by the vaginal smear test, whether infections in the genital tract suspend ovulation. The yellow body would be the center of suspicion. Such delay might well occur even under conditions less spectacular than in those instances of premature menopause reported by Oschner, which were found to be due to sudden chilling at the period and a resultant persistent corpus luteum, and shown by him to be curable by laparotomy and shelling out the offending mass. The veterinary has merely to reach into the bowel up to his elbow and by palpating through the rectal wall, clear out the yellow body with finger pressure. Thereafter, conception occurs in four days, 95 per cent of those so treated conceiving at the first service. It is possible that with thin and relaxed abdominal walls or a low-lying ovary, the human organ might be subjected to bimanual compression and the corpus ruptured. Halban, in speaking of amenorrhea due to corpus lutem cysts, while stating that these may subside spontaneously, draws attention to the ease with which they may be ruptured, owing to the thinness of their walls. Rubin suggests that unrecognized, absorbed, early gestation, intra- or extrauterine, may be the cause of corpus luteum cysts.

When a cow does not show estrum within sixty days after parturition, the delayed rupture is expedited manually. Perhaps doctors have been careless about resumption of menstruation after parturition and weaning, and in the absence of anemia or other adequate general reason to explain delay, they may have let ovaries neglect their duty and thereby have permitted one-child sterility to result. In cattle this question has a further practical bearing; by rupturing the yellow body four days before the desired heat, any preferred series of dates may be arranged for a bull which is overworked by the simultaneous estrum of his herd. Incidentally it may be noted that yohimbin is said by Williams to have no effect in producing estrum, though three writers have seen genital hyperemia in animals from its use. There is a report extant that a conspicuous pharmacologist has developed, by animal experiment, aphrodisiacs too effective to be published.

May small cysts in ovaries cause sterility or sexual excitability? Nymphomania with sterility occurs in all species of domesticated animals, but preeminently in the cow. It is never encountered in the pregnant animal. The symptoms are these: The heifer or cow bellows a great deal, even more than in estrum, and in a voice like a bull's. The actions are like those of an exaggerated estrum with mounting

of other cows or any other animal,—even man or a partition, or allowing estrous cows to mount her, and, with some exceptions, allowing copulation at any time. Thus, sexual appetite is intense in the presence of complete sterility. After a few weeks, the pelvic ligaments soften, the pelvis becomes deformed, and sacroiliac slipping produces a wabbling gait. Fractures of the pelvis are often seen. Atony of the genital canal occurs, with mucopurulent secretions. The course of this excitability is four or five years. Recovery occurs in 50 per cent of the cases. Chronicity is rare. It is particularly likely to take place in pedigreed dairy cows being forced for the severe tests and strain common to the endeavor to make official records for high milk and fat quantities. It cuts short the careers of many, so that prizes spell ruin.

Albrechsen says the cause lies in abnormal ovaries, usually cystic, 74 per cent being single cysts, 8 per cent multiple, 6 per cent thick-walled and deep, and 2 per cent tuberculous. As a cause, he claims infections and reports 86 per cent of cures by abolishing the infection. Williams speaks as if it were in a special type of cystic degeneration that nymphomania occurs, the ovisacs being distended with follicular liquid, and no rupture taking place, no lutein tissue developing, and no spontaneous cure to be expected. The cysts are one to three inches in diameter, one to four in number, not multilocular, and as a rule, present in both ovaries. Even if showing in only one ovary, the cow is sterile.

The treatment consists of crushing the cysts through rectal palpation, or crushing or puncture by the vagina. Since copulation makes the disease worse, the cow is kept from the company of her mates.

It would be of the weightiest moment if animal studies could furnish *tests applicable to women which could determine the date of ovulation.* We then could tell (1) what day or days in the intermenstrual period we should select for coitus (or artificial impregnation) in order to *render conception most probable,* that we might time the arrival of optimum semen in the tubes to meet the ovum there; (2) whether ovulation has ceased, in a given case of *sterility* or amenorrhea; (3) at what exact period in the menstrual cycle ovulation occurs, in order to settle whether (and when) a *"safe" period* exists; (4) whether irradiation of the ovaries in various dosages arrests ovulation, and how long the effect continues; (5) whether sperm injections hypodermically (spermatoxins) are as effective in women as in lower animals, in checking ovulation and the duration of the effect; (6) whether one of the new extracts would or would not control ovarian activity, either by arrest or stimulation; (7) whether an early *pregnancy* is present; (8) whether regularly menstruating women ovulate every month or can show a skipping habit, and (9) whether some women ovulate more than once a month.

*The Vaginal Epithelial Cycle and Ovulation.*—Stockard and Papanicoloau, in 1917, discovered that in the guinea pig there is a change in the vaginal secretion recurring just before each ovulation, by which the cycle can be accurately followed during life. The vaginal fluid contains leucocytes and desquamated epithelial cells. Between the periods of estrus, cells of both types are present but not very numerous. A few hours before ovulation, however, the leucocytes disappear, and there is a general desquamation of cornified epithelial cells, which are often shed from the vaginal wall in large sheets. A few hours thereafter the leucocytes reappear in great numbers, the epithelial cells disintegrate, and finally conditions revert to the interestrous state.

Long and Evans, studying 1000 white rats during a period of four years, very fully picture in their monumental work the changes in the vaginal epithelium. "There appears at any one time only one type of epithelium, the changes taking place at the same rate over the entire mucosal surface." The proliferation of vaginal epithelium during proestrus, the production of keratin, the raising of the vacuolar epithelium, and the casting off in estrus are always typical. Loeb (1923) states that it is the substance given off by the mature follicle that combines with the vaginal acid and there produces the marked proliferation. Corner, in young macacus rhesus monkeys, which have a menstrual cycle not unlike that of human beings, found a tendency toward cycle variation. Ovulation occurred about fourteen or fifteen days after the onset of the last menstruation in two animals in which the ovum was recovered from the fallopian tube. In six others, menstruation probably took place without ovulation. Lehmann (1921), from smears made in the gynecologic clinic, works out four types. His idea is that different degrees of leucocytosis depend upon the bacterial condition of the lower genital tract and that normal ovarian function protects the vaginal walls against bacterial invasion.

The Committee on Maternal Welfare was fortunate in bringing together biologist and clinician on this matter, and a considerable series of human tests is under way at the Woman's Hospital, New York. The monkey, however, will be our intermediary for some time yet.

*The day of ovulation in human beings.*—Among the wives of German soldiers who, early in the war, were only at home from two to eight days, many hundred observations were made (Siegel, Pryll, Zangemeister), which showed that the last six or seven days of the intermenstrual interval were practically sterile. Siegel's 320 cases showed a fertilization curve reaching its highest point on the sixth day after the beginning of the period, remaining at nearly the same height until the twelfth or thirteenth day, then sloping evenly to the twenty-first, with no conceptions from the twenty-second to the twenty-eighth day. As the result of laparotomy inspections, R. Meyer and Ruge II, examining 106 specimens, placed ovulation in the first week of the inter-

menstrual interval; but Ruge later made it between the eighth and fourteenth day after the beginning of the flow. Schroeder, from observations in 100 operations, placed rupture between the fourteenth and sixteenth day after onset of the period. Mere inspection at operation, however, is said by Papanicoloau to be of very moderate value, without sections. Snyder, from the state of tubal epithelium, believes the thirteenth day to be the time of rupture.

"If," says Corner (1923), "we accept a regular ovulation occurring about the twelfth day—that is, from the tenth to the fifteenth day before the onset of menstruation, and assume the viability of the germ cells in the oviduct for a space of two weeks following coitus, then all the known interrelations of the human reproductive cycle can be seen to follow." He goes on to say that there is a bare possibility that, if all the causes of error be ruled out of such statistics as Siegel's, the human female might actually be found to be fertile only during a limited portion of each cycle near the day of ovulation. In the end, the problem, as it especially concerns our own species, "will be solved by taking into the clinic the great advances in method now in the making by physiologic anatomists."

We have made search for studies that would indicate the *frequency of intercourse most favorable* both for impregnation and health, and also any that will demonstrate what interval produces a semen that is optimum. In general, it may be said that the average frequency of coitus in cattle ranges close to that of human beings. Katherine Davis, studying 1,000 educated American couples, at about the age of thirty years, showed twice a week to be the most frequent habit, while 10 per cent cohabited daily or oftener. While the number of copulations which a bull should be permitted is said not to have been sufficiently studied, and there are known to be wide variations in the power of sexual endurance, yet veterinary practice is fairly agreed upon the following: In 2000 observations on brood mares, Pearson, Lee and Moore report the commonest frequency to be two foals produced by three coverings. The average productivity is said by Williams to be one viable calf for each three services. In an exceptionally healthy herd 43 per cent succeeded, with 40 per cent viable calves resulting. Two copulations a week is the probable maximum of efficiency measured by percentage of pregnancies, their safety, and the vigor of the young either with bull or stallion. Three cows in any one day is considered the limit by Zschokke, to be followed by a rest of one or two days. Noted stallions are said to have served 200 to 300 mares in a year, without injury. Clinically, bull after bull is found breaking down after very moderate use with too frequent service. Also the spermatozoa disappear entirely under these conditions. Younger animals are carefully guarded against overuse, being restricted to one-third of the service of full-grown adults.

*Does the fertile period last many days?* The cow is willing to take the bull once in three weeks. The bull in pasture promptly recognizes estrum. In controlled breeding, estrum is frequently too far advanced when discovered for coitus to succeed, many periods being overlooked. The healthiest cows have the shortest duration of estrum, frequently dropping to or below fifteen hours. So one has to watch a cow twice a day, or else lose three weeks.

Animal studies have a bearing on the question raised with human beings, concerning the relative importance of *ejaculation of semen directly into the uterus.* This process cannot occur in the cow, for the cervical canal is too small for any penetration by the bull's organ, and the copulatory injuries that sometimes occur are never in the cervix, but only in the vagina. Also it is found that after amputation of the bull's penis the relation is quite as effective as before. In heat, the cervix, always corrugated, is somewhat relaxed, and the canal, while not dilated, is more dilatable than at other times. The hyperemic cervix permits entry by the finger. On the other hand, in rams there is a phallic uterine installation tube, a long slender process. When this is cut off, as it is purposely done on the march to markets, conception cannot occur.

Does the *cervix suck in semen?* Heape has described such an action in the rabbit, the os uteri dipping down into the semen in the bottom of the vagina, to be withdrawn again in coordination with a rhythmical contraction by the uterine muscles. Human reports are conspicuous for their infrequency of actual observation of this action.

What studies of semen and testes in animals suggest research for betterment in the human male?

*Testicles.*—In the horse the testicles are rarely of the same size, the right being clearly the larger, as a rule. Firmness and density are found to be an important index of healthy organs. The commonest seat of infection is the tail of the epididymis. Cryptorchidism in bulls is likely to be passed on to progeny. The intraabdominal testicle does not function because it is in too warm a spot. An active testis after being transplanted inside the belly ceases to form spermatozoa. Testis grafts cease to form sperms if planted anywhere but in the right temperature, as in the scrotum. In the guinea pig, if the testis is exposed to heat 8 degrees above normal for five to ten minutes, the spermatozoa are killed and all the seminiferous tubules damaged; but the mother cells may recover and repair the damage. It is reported that some Japanese males may be sterile from hot baths, as the Japanese stand temperatures of 115 degrees readily.

As to the *best interval* for producing vigorous semen,—in dogs there was no betterment after a ten-day wait (Lloyd, Jones and Hays). This is in accord with a limited series of my own wherein seven to ten

days produced the best specimens, and thereafter the quality deteriorated.

*Semen.*—Horse semen kept at body temperature is killed by its own germ growth. After withdrawal from the vagina of mare and cow, the motility of the sperms persists about four hours under laboratory conditions. The spermatozoa traverse the twenty to twenty-five inches of the cervico-uterotubal canal in two or three hours. In the rabbit, Hensen estimates that the migration of the semen requires from fifteen minutes to two hours.

Williams gives several clinical studies of individual semens of bulls, with microphotographs. Where there is much abortion, the sperm was always found to be pathologic. He determined the presence of the streptococcus, Staphylococcus albus, and the colon bacillus in bulls whose fertility had lessened or disappeared. The author pictures small-headed and tailless and other abnormal forms familiar to the medical eye. Some of these animals yielded 30 per cent to 66 per cent of conceptions. Cows not conceiving with a bull below par, gave a higher or perfect ratio with other bulls. In an animal with a low motility sperm and 30 per cent conceptions and 38 per cent abortions, vesiculitis and spermatocystitis were found. After the death of the animal, cultures from the genitals were negative.

Sperm loses power in proportion to dilution. There is a direct relation between duration of fertilizing power and concentration. "The fertilizing substance is identical with the agglutinizing substance of the spermatozoon, which is lost by staling" (Gemmil). Lillie says twenty-four hours is the likely limit of capacity to fertilize. Mall declares that sperms have lost their fertilizing power by the time they have passed the tube. In 25 cows killed for the purpose of study, Lewis found, in only three, sperms alive more than twenty hours. Boyce and Teacher (and Triepel also) conclude that fertilization must occur within forty-eight hours after copulation. Lillie shows that sperms are exceedingly sensitive organisms in several respects, and draws attention to the fact that motility is not a criterion of fertilizing power and that living the long periods claimed does not mean that the sperms can fertilize all that time. Their life depends not a little on the rapidity with which they use up their own energy. Constantly giving off $CO_2$, they make the fluid in which they are suspended sufficiently acid to inhibit their own movements. Thus immobilizing themselves in the testis, they save energy till ejaculation. Then the $CO_2$ is absorbed by the neutral prostatic secretion. Anything over 0.045 per cent solution of several acids kills horse sperm. Semen is buffered against both acids and alkalies (Heape). Anderson found the behavior of the semen of a large number of mammals to various agencies very similar.

*Reactions between vaginal secretion and semen* have been studied in guinea pigs by Papanicoloau, particularly the destruction of spermatozoa by phagocytes. The advantage of this study in lower animals is that they have a copulation period. Moreover, the cycle being exactly known, the action of various bacteria can be developed. Every form of bacteria in the vagina is found to have a modifying influence on the expressions of the cycle. The bearing of those facts on sterility is evident, and also on the use in the vagina of chemical agents and their vehicles as contraceptive agents. Kross, for instance, in his work at the Crocker Laboratory, tested the effect of Cary's formula on rabbits and found that 2 per cent lactic acid had no restrictive effect on conception.

Is semen absorbed? Do sperms penetrate the vaginal walls? Can excessive semen absorption cause sterility? Can dilutions of semen, given hypodermically, suspend ovulation?

Kohlbrugge reports that in normal copulation of rats and other rodents the spermatozoa penetrate the epithelium of the generative mucosa and invade the underlying connective tissue. If this process takes place in women, the sterility that is common among professional prostitutes may be in part due to spermatoxins; and this might be the cause of sterility with strong sperm, open tubes, proved ovulation, and very frequent intercourse. There is said to be an Abderhalden reaction to testicular proteins after every coitus.

*Spermatoxins* were produced in 1899 by Metchnikoff and by Landsteiner. The former developed an isospermic serum. De Leslie rendered male mice sterile in from four to five times the normal interval, by injection of spermatoxin serum.

Dittler found that by immunizing female rabbits with progressive doses of dilute rabbit ejaculation, they were made sterile for a period of four months or longer. He injected into the ear vein the fluid which he withdrew from the vagina after copulation, and which he gave at intervals of one to eight days, repeating the injection two to ten times until a total of 2 to 5 c.c. had been given. He continued the injection until an antibody had been found in the blood,—usually within six to eight days. Ovulation was not hindered, nor was behavior affected, and no anaphylaxis occurred. There was no individual specificity.

Guyer speaks of "spermatoxic" sera prepared by injecting fowls repeatedly with the sperm of rabbits which are toxic in vitro for the spermatozoa of both rabbits and guinea pigs. When introduced into the blood stream of male rabbits at intervals, for four to five weeks, such serum produced partial or complete sterility. Even complete disappearance of spermatozoa from the semen occurred. Microscopic examination of the testis of a serum-treated male showed disintegration changes taking place in the seminiferous tubules. The sper-

matozoa of a rabbit which has been repeatedly injected with its own semen are much less viable both in normal rabbit semen and in spermatoxic serum than are normal spermatozoa.

McCartney found that (1) female rats could be sterilized for a period of from two to twenty-two weeks by subcutaneous injection of spermatozoa or testes extract, combining the work of Guyer and Dittler; (2) the sterility seems to be due to the presence of spermatoxins in the vaginal and uterine secretions of the immunized animal, and that (3) within limits, the degree of immunity appears to be proportionate to the amount of antigen injected. Kennedy found autosperm worked best and degeneration rare in the testicles of guinea pigs.

*Sterility and genital infections.*—Evans found rats had infections, often epidemic, not unlike gonorrhea. Their sterility runs from 10 to 15 per cent, the highest figures occurring among the domesticated albinos. Reynolds and Macomber report it as high as 20 to 35 per cent in certain strains. No animal carries infection in the birth canal more commonly than the sow. Among cows, there is a great frequency of placental retention (25 per cent). Infection of the genital canal in cows runs, in some herds, as high as 60 per cent. The descriptions exhibit curious parallels to those concerning women, along the lines of pyosalpinx, hydrosalpinx, and ovarian or pelvic abscess. Pyometra seems common, however, and the granular venereal disease widespread. The Streptococcus viridans is the most frequent organism found in the vagina, as also in the semen.

Abortions in heifers and cows run about 19 per cent. Ergot will produce abortion, but only just before it causes the death of the mother. Therefore, the best way to abort a cow seems to be to reach up into its bowel and rupture the corpus luteum of pregnancy. In from one to three days the uterus empties itself; this again raises the query as to whether the corpus luteum can be ruptured in thin women by rectoabdominal seizure, thereby interrupting pregnancy.

Is *sterility among apparently healthy animals* a common occurrence? We have noted the frequency among prolific animals like rats. The Danish Breeders' societies show from year to year a constant of 11 per cent sterility and abortions, taken together. Albrechsen shows that temporary sterility averaged, in 112,400 head, close to 5 per cent. On some farms, 20 to 30 to 100 per cent are temporarily sterile; on others, none. He says 76 per cent is a good conception rate. It may be noted that in rats in the laboratory, pregnancy can be expected following 80 per cent of single copulation.

In bulls sterility is common and generally due to inflammatory trouble or infection of the seminal vesicles, or of seminiferous tubules and epididymis. No bull, says Williams, should be bought until his semen has been examined for motility, morphology, and bacteria. Liv-

ing spermatozoa, however abundant, do not in and of themselves afford proof of fertility. They may be deformed or diseased or the secretions of prostate and vesicles may contain germ growth fatal to them. Some sterile bulls apparently render females sterile.

Diarrhea or pneumonia in the young calf causes low fertility at adult age. Cervical atresia is a negligible cause of sterility, and endocervicitis constitutes the most common affection, as in women. Tuff, in 97 sterile cows, could identify disease in 64, mostly cervical catarrh. The assumption is false, says Williams, that a cow may be sterile with a very fertile bull and yet conceive with some other bull.

During the most active stages of growth animals do not breed. Ovulation and spermatogenesis cease during acute infectious disease. Overwork, such as the training of stallions for the turf, causes temporary sterility with no evidence of injury to procreative power later. Nutrition plays an important part. Semiwild cattle generally conceive when the grazing is best. Mere quantity of food does not necessarily give proper nutrition or secure estrum and fertility. Obesity may show the reverse of vigor, though obesity and vigor may coexist. The sterile heifer or cow frequently has irregular lumpy deposits of fat, especially great lumps about the external iliac and ischiatic tuberosities. The hair becomes rough and lusterless. The genitals may be normal save for rather small ovaries. The estrum may be capricious. Impotence in the obese male is due to confinement, high feeding, and lack of exercise. In countries where cattle are habitually worked, like Korea and Japan, the bulls are kept in breeding condition by moderate draft service. Such work prevents viciousness. Some animals will breed although steadily subjected to any or all errors in care and overfeeding. In the breeding male, the proteins are pushed. The relations of vitamines to fertility will be taken up in another paper.

Is it true that *artificial insemination* in cattle can give us data of value? The process is not difficult and there can be no question of its efficacy. It will never be important, Williams thinks. It is chiefly of use in fashionable sires to conserve their strength, but it queers the pedigree. The procedure must approximate the essentials of normal coitus and be used during the one day or one-half day estrum. Moreover, when semen has to be secured after coitus from the vagina of one female in order to be conveyed to that of another, disease may be thus conveyed among animals. Ivanow reports 8000 mares artificially impregnated by his group in Russia.

Further problems, such as the effect of irradiation in stimulating or arresting ovarian activities (on which the committee is furthering animal research); the relative fertility of intergrade or intersex individuals, and vitamin-nutrition experiments, are part of a second paper. The foregoing are samples of urgently needed studies on fer-

tility and sterility that are scattering and unorganized. To secure orderly progress and timely transfers from one science to another, and adequate funds, a forward step is in order. Such a step would be for many or all of the agencies studying sex problems, infrahuman, human, or social, to clear and confer through a stated meeting of representatives, or under some existing organization, or through interlocking directorates, or else one or more liaison officers might be made responsible.

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438 West One Hundred Sixteenth Street.

*Marshall gives many bibliographic references, and to this standard volume the reader is referred for general information.

## DISCUSSION

DR. JAS. A. CORSCADEN.—In our "Sterility Clinic" we have been interested to find how many women become pregnant. It does not take any elaborate technic, no color index or any other particular laboratory methods, to determine whether your sterility efforts have been successful or whether they have not. The end-result is fairly obvious. All you need is some system whereby the individual so treated will be followed up so that out of 500, 1,000 or 10,000 individuals you will be able to tell how many have become pregnant.

I am afraid we have become reactionary; that is to say, we have come back to the management of the simpler conditions, such as chronic cervicitis, obvious mechanical obstructions, and then we have put in a classification designated either as primary sterility, essential sterility, or whatever name you want to give it—the group of cases in which we cannot find anything wrong,—the tubes are patent, the anatomy is normal, and the male is normal. It is in this type of case that I think animal studies will help out as far as the cystic fluid, etc., may be concerned, coupled with studies of the semen. I am very apt in looking over the records of an operation, to find in only 5 per cent of cases a minute description of the state of the corpus luteum so that an investigator could determine the relationship of the state of the ovary to the dates of the last two or three menstrual periods.

DR. HAROLD BAILEY.—There is a point in Dr. Dickinson's elaboration of this subject that I believe needs some explanation if we compare the spermatozoa of the bull to that of man. If women are more fecund from the sixth to the twelfth day after menstruation starts, and yet ovulate from the fourteenth to the eighteenth day, as most of us believe they do, there is a lapse of from four or five days to a week, which means that the spermatozoon of man retains its vitality that long. If the spermatozoon of the bull lasts but twelve to forty-eight hours, then apparently it cannot be compared to that of man.

DR. GEORGE GRAY WARD.—I would like to ask Dr. Dickinson whether the fact that the woman is menstruating is not an indication that she is ovulating. Dr. Stockard has asked us to join in a clinical study of this subject at the Woman's Hospital. We are to study a series of women every day for three months, taking a daily vaginal smear in order that the changes which occur in the epithelium cyclically just as in the uterine mucosa, may be noted and the exact time of ovulation determined.

DR. ROBERT L. DICKINSON.—I was glad that Dr. Corscaden thought it was wise to organize the various items of these studies because we have the proper people to do them if we can get financial aid, and, because our results are so scanty in the cure of sterility that it is time we did take hold. I am not speaking of the hopelessly gummed-up pelves that may or may not clear up years later; I am speaking of the simpler causes. We have scant statistics concerning results in attempted cure of sterility, and the claims that are made are often such as those in this new book of Reynolds and Macomber. They affirm that the "majority" of these cases are curable. They advocate (after the husband is proved fertile) anesthetizing every sterile woman to examine her. Then one gathers from the book that most sterile women should have their abdomens opened. "Open closed tubes," say the authors, "and expect success." For years I have been asking Reynolds and Childs to give their actual results. "What proportion of your salpingostomies has resulted in pregnancy?" Childs replied, "I have eleven successful cases." "Out of how many?" "I do not know." Reynolds, year after year at the A. M. A. meetings has brought out only his successes and

has said when his book came out he would tell what proportion of successes he has had.

In the book by Funck-Brentano and Plauchu on the "Treatment of Sterility in Women" (1912), there are figures and figures. The best results claimed, putting all the series together that give figures, are 10 to 12 per cent of successes. Will you open nine abdomens to get one result? And these are the enthusiasts that present these results. Solomon, of Dublin, with his unique claims in *Surgery, Gynecology and Obstetrics* hardly merits serious discussion.

It is really a grievous thing for our special study, that a man who knows as much as Reynolds and has as large experience should open as many abdomens and not keep histories or else not dare to publish failures. He alone could answer Dr. Ward because he has observed a series of unions where husbands with vigorous semen were mated to wives with open tubes and menstruating regularly, yet with ovaries that showed no scars of ovulation on them and no corpora lutea. You know he advocates decapsulation. I know of patients whom his operation failed to relieve.

A book which I would particularly recommend is by Harry H. Laughlin, of Cold Spring Harbor.* He has collected everything that can be said about sterilization, every case reported sterilized in institutions in the United States (3300 in number). The females are one-third of the males. One state of the United States is said (since these figures were collected) to have had 10,000 sterilizations.

There is a rousing in the matter not only concerning the social menace from the progeny of the hopelessly insane and unfit, but the need of a check on the product of the degenerate whose unions reach 7.2 children each. If these people will not carry out simple contraceptive measures we must offer them simple ways of sterilization. It is incumbent upon us to study secure methods of sterilization in the woman now that insufflation is showing that the uterine cornua reopen in no small proportion of cases.

Dr. Ryder raises the question of sterility due to low protein diet. Leo Loeb, years ago, showed that ovulation was influenced by feeding, and Reynolds and Macomber have carried further the study in rats that shows that protein and vitamine X have a very clear-cut influence on fertility in rats.

*Eugenical Sterilization in the United States. Research by the Municipal Court of Chicago.

# AN INVESTIGATION INTO THE CAUSATION OF THE ONSET OF LABOR BY PARABIOSIS DURING PREGNANCY*

By Isidor Kross, M.D., New York
*(Adjunct Gynecologist, Mt. Sinai Hospital)*

FROM the very beginning of medicine, the inquiring mind has delved into the as yet unsolved problem of childbirth. Today, with all our modern advances, we are as much in the dark regarding the factor responsible for the onset of labor as was Hippocrates.

Many theories have been advanced and stoutly maintained by those professing them, but they have all been proved to be fruitless. Some teach that when the product of conception becomes mature it takes on the properties of a foreign body as a result of decidual degeneration and disappearance of placental septa, and then is expelled.

Others hold that an increase in $CO_2$ in the uterine blood following thrombosis of the placental vessels is the causative factor (Leopold). Excessive distention of the uterus was considered by some as being the responsible factor, but clinical experience in cases of twins and hydramnios militates against this theory. Increased irritability of the uterus and the influence of menstrual periodicity has likewise been advanced. The pressure of the presenting part on the lower uterine segment and upon the nerve plexus has been held accountable by others, among them Galen. This is equally untenable in that it does not explain the onset of labor in transverse and breech presentation and still less the uterine contractions that come on at the definite termination of gestation in abdominal pregnancies. Another theory holds the essential factor to be the markedly increased irritability of the uterus at this time. This is perfectly true but only restates the condition without explaining it. Of late there has been brought forward the hypothesis that labor is an anaphylactic phenomenon. Up to the present time, this is apparently the most logical theory, and, while not proved, has at least some apparently rational basis for its existence.

In 1910, Sauerbruch and Heyde published their results in a most interesting series of experiments. These experiments were inspired by the publication by Basch of the famous case of the parabiotic Blatscheck sisters. These two sisters were twins of the pygopagus type; the organic union was located in the sacral bones. All the organs were double except the rectum and the introitus which were held in common. When one of these sisters became pregnant, the non-pregnant one was found to have as much milk secretion as the gravid

*Read at the Annual Meeting of the New York State Medical Society, April, 1925.

sister. The nonpregnant sister also developed the same skin pigmentation as was found in the gravid one.

Investigators who have studied the problem of parabiosis have proved definitely that in animals in which this state was reproduced by surgical means there occurred passage of fluids (solutions of potassium iodide and strychnine, etc.) and solids, coloring matter and bacteria from one animal to the other. Sauerbruch and Heyde employed this method of investigation to determine if possible whether substances are produced during labor in the pregnant animal that have any specific effect upon the onset of labor. In their first series of experiments the authors united a nonpregnant animal, in some instances a male, to a second animal well advanced in pregnancy. In two instances labor set in after fourteen days, in five others the interval between operation and the onset of labor varied between five to eight days. In other words, the period preceding labor was sufficient to allow for a satisfactory interchange of fluids between the two animals. During the first few days after operation, nothing of any significance was noted. However, several hours before, a bloody vaginal discharge was noted—this indicating the onset of labor in the pregnant animal—the other animal irrespective of sex became definitely ill. At first a peculiar fatigue was apparent; this gradually became more marked and soon incapacitated the animal. The eyes became swollen, the hair lost its smoothness, and at times there was an escape of urine and feces. The appetite disappeared and the animal did not react to external stimulation. This apathy lasted throughout the period of labor and for some time beyond it. During this period there occurred in most instances, convulsions either spontaneous or brought on by external stimulation. The very seriously affected animals died during or shortly after delivery. Those not so seriously affected gradually recovered and in one to eight days were back to their normal status. The animal that was littering showed no ill effects of any kind. It was noticed that the longer the interval of parabiotic union before delivery, the less intensive were the effects upon the nonpregnant animal.

In a second series, two groups of animals (rats) were employed to determine the effect of labor in one animal upon its partner. For this purpose, the animals were so selected that in the one pregnancy was far more advanced than in the other. In every instance, the animal in advanced pregnancy littered live young at the normal time. In two instances the phenomenon of labor had no effect upon the other animal, each of which littered some fourteen days later at the end of their own gestation period. In these two instances the rat in labor produced no ill effects upon its partner. In three other instances, during the delivery of the full term rats, the partners much less advanced in pregnancy had a marked bloody vaginal discharge

and shortly after gave birth to nonviable fetuses. These animals after aborting, rapidly recovered from their exhaustion and remained alive.

Morpurgo explains the illness of the nondelivering animal as due to the sudden lowering of the intraabdominal pressure. This mechanical theory cannot, however, stand because (1) the illness begins before delivery, and (2) the illness is much less marked in those animals where the interval of parabiotic union before delivery is long, and more severe when the interval is short. The nature of the affection points rather to an intoxication. The lack of disturbances in some animals and the varying degrees of intensity in others depend upon the development of an immunity complete in the first and less developed in the others and entirely absent in those animals that succumb. This assumption of immunity is strengthened by the absence of any condition in the pregnant pair similar to that which exists in the nonpregnant partner of the first series of experiments. The author explains the illness of the partners on the ground of protein sensitization which occurs during the period of pregnancy with the sudden invasion of larger quantities of protein during delivery, overwhelming the sensitized animal and producing extreme asthenia, etc.

Von der Heide has formulated the theory which maintains that the onset of labor is really a phenomenon of anaphylaxis. Fetal products enter the maternal system, there setting up antibodies. He calls them labor inducing substances. These increase in quantity towards the termination of gestation, and last throughout the entire period of delivery. He maintains that in all of his patients with weak labor pains, the injection of fetal serum produced successful results.

In investigating this problem, von der Heide employed the serum obtained from the blood of the umbilical cord immediately after the birth of the fetus. The fetal serum from this blood was injected either subcutaneously or intravenously into several groups of patients. In his first group, it was employed to induce labor. He reports six cases in every one of which he succeeded in bringing on labor by the injection of 2 to 17.5 c.c. within a period of time varying from ten minutes to four hours. In a second group of three cases the injection of fetal substance brought on weak irregular labor pains that soon ceased. In a third group the fetal substance was employed intrapartum for weak ineffectual labor pains. In a series of six cases there were five successful results. Group 4 consisted of eight unsuccessful cases. Group 5 received injections of fetal substance intramuscularly without success. Basing his contention on Group 3 the author maintains that fetal substance not only acts primarily in inducing labor pains but also secondarily in strengthening them when weak. A careful analysis of the individual patients cannot but lead to the conclusion that his successful cases simply ran a clinical course that is quite common and that the labor pains after the fetal substance injections were not really due to this substance. In fact all his unsuccessful cases tend to militate against his assumption.

R. Franz maintains the stand that the onset of labor is due to an intoxication set up by protein split products brought on by ferment action upon placental tissue.

Rongy conducted a series of experiments upon nineteen pregnant women using fetal substance according to von der Heide's method. In analyzing these cases, we find that in ten of them (Nos. 3, 5, 7, 8, 9, 11, 12, 14, 16, 17) there was complete failure of any positive action of the fetal substance, and that in the other nine one cannot positively prove that it was the serum that produced the effect because untreated cases very commonly run a similar course.

John A. Kolmer employed pregnant guinea pigs in his study of the effects of serum injection. He divided his animals into several groups, according to the procedure employed.

*First Group.*—Serum was obtained from three guinea pigs that were about ready to litter. This was injected subcutaneously and intravenously within an hour into five other guinea pigs that were practically at term.

Experiment 1. Pregnant guinea pig, multipara, received 2 c.c. serum subcutaneously. No effect. Passed into normal labor two days later.

Experiment 2. Pregnant guinea pig, multipara, received 1.5 c.c. serum intravenously; no effect. No labor for three days following.

Experiment 9. Pregnant guinea pig, primipara, received 2 c.c. serum intravenously; no effect. Passed into normal labor two days later.

Experiment 15. Pregnant guinea pig, received 1.5 c.c. intravenously; no effect. Labor four days later.

Experiment 17. Pregnant guinea pig, multipara, received 2 c.c. intravenously; no effect. No labor for next forty-eight hours. The serum was obtained by removing the young and the placentae by abdominal section and centrifugalizing the blood.

*Second group.*—Serum of three mother pigs collected within a few minutes after birth of young.

Experiment 10. Pregnant pig, received 1.2 c.c. serum intravenously; no effect. Labor two days later.

Experiment 13. Pregnant guinea pig, received 1.8 c.c. intravenously; no effect. Labor occurred twenty hours later.

Experiment 14. Pregnant guinea pig, 0.8 c.c. intravenously; no effect. Labor occurred three days later.

*Third group.*—Serum collected from six pigs removed by abdominal section. Also serum collected from three young pigs immediately after birth.

Experiment 3. Pregnant guinea pig, received 1.3 c.c. serum intravenously; no effect. Labor occurred seventy-two hours later.

Experiment 4. Pregnant guinea pig received 1.4 c.c. serum intravenously; no effect. No labor for next three days.

Experiment 16. Pregnant guinea pig received 2 c.c. serum subcutaneously; no effect. No labor for two days.

Experiment 18. Pregnant guinea pig received 1.8 c.c. intravenously; no effect. No labor for two days.

*Fourth group.*—Placentae of three animals removed at time of abdominal section. Ground in mortar with sterile saline and centrifugalized.

Experiment 8. Pregnant guinea pig received 2 c.c. of placental extract intravenously; no effect. No labor for three days.

Experiment 5. Pregnant guinea pig, received 1.8 c.c. intravenously. Labor twenty-four hours later.

Experiment 19. Pregnant guinea pig received 2.2 c.c. intravenously. Labor thirty hours later.

*Fifth group.*—Experiments 6, 7, 17, 20, 21, 22. Five pregnant guinea pigs received intravenous injections of serum from 1 to 2.5 c.c. removed from human placental blood. No immediate effect. Labor occurred one to five days after injection.

In 1912, Dr. Kolmer in cooperation with Dr. D. M. Anspach injected human placental serum into eight patients at or near term. The results in all cases were negative.

Heide's theory that gradual sensitization of the mother by fetal toxins with onset of labor due to sudden intoxication with a large dose of fetal antigen, thus considering labor an anaphylactic process, is not supported by Kolmer's experiments.

Owing to the inconstant and rather unsatisfactory relationship between the conclusions of the various authors and their actual findings, as described in their protocols, the author decided to perform a series of parabiotic experiments and note the effect, if any, that labor had upon pregnant animals.

### TECHNIC

Fully mature pregnant rats were employed. An artificial parabiosis (Siamese twins, so to speak) was produced. This was done by making a flank incision through the entire thickness of the abdominal wall, opening into the peritoneal cavity from the last rib above to the pelvis below. A similar incision was made in the second animal on the opposite side. The two animals were now united by the same technic employed in performing an intestinal anastomosis. The peritoneum and muscle were united as one layer, the fascia as a second and the skin as a third. When completed, the two animals possessed a common peritoneal cavity. In every instance the two animals were so selected that the gravidity was distinctly more advanced in the one than it was in the other. Each pair of animals was kept in its own cage.

Parabiotic pair No. 1. Operation January 10, 1924. Moderately advanced gravidity. Right more advanced than left. On January 16, the right rat littered, dropping four young; the left animal was unaffected. On January 22, six days later, the left rat littered, dropping five young. Both animals were quite well. Result negative.

Parabiotic pair No. 3. Operation January 23, 1924. Right more advanced than left. On January 28, there was seen at the line of suture an evisceration of the intestines with gangrene of the gut. Animals were alive,—sacrificed.

Parabiotic pair No. 2. Operation January 21, 1924. Right more advanced than left. On January 24, the right animal was found dead,—intestinal prolapse. Left killed.

Parabiotic pair No. 4. Operation January 24, 1924. Right more advanced pregnancy than left. Right rat littered on January 31, dropping nine young. Left animal littered on February 4, four days later. Result negative.

Parabiotic pair No. 5. Operation January 25, 1924. Right more advanced pregnancy than left. On January 31 the right animal littered, dropping four young. On February 3, three days later, the left animal littered, dropping three young. Result negative.

Parabiotic pair No. 6. Operation January 28, 1924. Right less advanced pregnancy than left. On February 4 the left rat littered. On February 7, three days later, both animals were found dead. Autopsy showed uterus of left animal entirely empty. Lungs showed pneumonia. Right rat had three fully developed fetuses in uterus. Result negative.

Parabiotic pair No. 7. Operation January 29, 1924. Right rat less advanced in pregnancy than left. On February 2, the left rat littered, dropping eight young. On February 6, four days later, the right rat littered, dropping two young. Result negative.

Parabiotic pair No. 8. Operation February 7, 1924. Right animal less advanced pregnancy than left. On February 13, the right rat littered, dropping five young.

On February 18, five days later, the animals were found dead. Autopsy: Right rat, uterus empty, lungs show pneumonia. Left rat, uterus contains four fetuses. Result negative.

Parabiotic pair No. 9. Operation February 7, 1924. Right less advanced pregnancy than left. On February 11, the left rat littered, dropping six young. On February 13, two days later, the right rat littered. Result negative.

Parabiotic pair No. 10. Operation February 11, 1924. Right less advanced pregnancy than left. On February 16, both animals were found to have littered.

Parabiotic pair No. 11. Operation February 12, 1924. Right less advanced pregnancy than left. On February 15, the left rat littered, dropping four young. On February 18, three days later, the right rat littered, one young. Result negative.

## SUMMARY

Eleven pairs of pregnant rats were united in parabiosis. Pairs No. 2 and No. 3 died before the animals went into labor. Of the remaining nine pairs, all except No. 10 went into labor at the usual time at the termination of their respective periods of gestation. The animal less advanced in pregnancy continued to the end of its normal gestation period without being in the slightest degree affected by the labor of its partner. In pair No. 10, both animals littered at approximately the same time.

In view of the normally completed course of gestation in the other eight pairs, it would be a rather illogical assumption to explain this solitary instance on the basis of an anaphylactic phenomenon as Sauerbruch and Heyde, von der Heide, and Rongy, have assumed. It is much more likely that the stage of gestation in both animals was about the same and that the somewhat enlarged size of the fetuses in the left rat was due simply to the fact that, in that breed of animals the size of the young was larger because of the smaller number of fetuses.

## CONCLUSION

Fascinating as is the theory of labor as an anaphylactic phenomenon, and logical as are the theoretic assumptions made in its behalf, the results of these experiments have shown that in the rats employed, no labor inducing substances are produced during labor that have any appreciable influence upon the course of pregnancy in the partner of a parabiotic pregnant pair.

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20 West Fiftieth Street.

# NOTES ON THE ETIOLOGY AND EPIDEMIOLOGY OF IMPETIGO CONTAGIOSA NEONATORUM*

By David L. Belding, M.D., Boston, Mass.

IMPETIGO contagiosa neonatorum, an infectious skin disease in newly born infants, presents a serious problem in maternity hospitals. Its ease of transmission and, at times, its high mortality, make the disease dreaded by obstetricians. Reports from all parts of the world testify to the wide distribution of this infectious disease. Because of its varied symptoms, it has been described under a variety of names, such as pemphigus neonatorum, pemphigoid, dermatitis exfoliativa, and impetigo contagiosa bullosa.

Three epidemics have been observed in the Robinson Memorial Hospital, Boston, during the past eight years. The first necessitated the closing of the hospital, the second was less severe, and the third extremely mild. In the second epidemic the etiologic and epidemiologic studies which are described in this paper were made. Owing to the excellent reviews of a somewhat voluminous literature, by several recent investigators, the scope of this paper is confined to our particular observations, and only those references are cited which bear directly on the points at issue.

## CLINICAL SYMPTOMS

The disease is characterized by vesicle and bleb formation and at times by an exfoliation of the upper layer of the epidermis. In susceptible cases its rapid progress through the formation of new lesions, and the peripheral extension of old, may produce a dermatitis exfoliativa neonatorum.

The first lesion appears as a small vesicle with a slightly inflamed or hyperemic base, most frequently on the exposed surfaces, such as the head and hands, later extending to the moist opposing skin surfaces, as neck, axilla, or groin. In some instances the ruptured or unruptured vesicle heals without extension and with little or no crusting; in others, it extends peripherally until a large bleb is formed. The fluid at first is clear, but later becomes turbid. The skin is at first tense, then flaccid, and finally ruptures. In fatal cases large areas of denuded skin similar to burns result from the extension or the coalescence of several bullae. If the process does not advance too rapidly, various stages of skin regeneration may be found.

All grades of skin involvement occur in the same epidemic, ranging from mild, questionable lesions to severe exfoliation. The proportion

*Contributions from the Evans Memorial. No. C24. Series 102.

of mild and severe cases varies with the epidemic, indicating a difference in the virulence of the infecting organism. In the malignant cases the diagnosis is indicated by the rapid progress, autoinoculability, bleb formation, and exfoliative lesions. The mild type is characterized by the formation of small vesicles which later become pustular, usually heal promptly without scarring, and show little tendency to peripheral extension. Of seventeen patients, three showed the bullous spreading type; seven, a combination of the vesicular and bullous, and seven, the vesicular alone with isolated or grouped lesions. The appearance of the disease ranged from the first to the ninth day after birth, appearing from the third to the fifth day in two-thirds of the patients. Most of the cases recorded by three investigators occurred between the fourth and seventh days.

The infant, except for the discomfort resulting from the loss of skin, at first evidences no constitutional symptoms. In the fatal cases a general septic condition with subnormal temperature, due to toxic absorption and faulty elimination from the denuded skin areas, rapidly develops shortly before death. The prognosis depends upon the extent and rapidity of the exfoliation and the general resistance of the infant. Postmortem findings, as a rule, give little information.

## ETIOLOGY

*Cultures.*—Although the adult form of impetigo has been attributed to a variety of organisms, most investigators believe that the streptococcus is the primary agent in the vesicular type of Tisbury Fox and that the staphylococcus is a secondary invader; whereas, the pustular type of Bockhart is due to the staphylococcus. According to three investigators, pure cultures of streptococci isolated from impetigo vesicles have produced typical lesions of the disease in man, but serologic and cultural studies of such streptococci by four investigators indicate no uniformity in the strains. It would appear that the causative agent of the adult type of impetigo contagiosa is a skin streptococcus of exalted virulence.

With the exception of the bullous type of adult impetigo, the disease in infants seems clinically and etiologically different. At least eighteen investigators have concluded that the Staphylococcus aureus is the invading organism in the impetigo of infants.

In our three epidemics, the prevailing organism was Staphylococcus aureus. The Staphylococcus albus, a Gram-positive bacillus, and a hemolytic streptococcus were occasionally found. No pathogenicity was observed in skin inoculations except with the Staphylococcus aureus and the hemolytic streptococcus, and variations were noted in the different strains of Staphylococcus aureus. The particular strain described in this paper was isolated in the second epidemic. The chief difficulty was to obtain cultures uncontaminated with skin staphylo-

cocci. Aerobic and anaerobic methods with a large assortment of general and special media were used. From a review of the literature and from our observation in a more restricted field, it is evident that the impetigo strain differs from the ordinary Staphylococcus aureus in its pathogenic action and that this pathogenicity varies in the different epidemics.

No gross cultural differences between the impetigo staphylococcus and the ordinary Staphylococcus aureus could be determined. The fermentation reactions of a strain from an infant with impetigo which produced lesions of the disease, and from another which did not cause such lesions were practically the same. Acid developed in glucose, lactose, saccharose, maltose, levulose, and mannite, but not in raffinose, salicin, and inulin for both strains, a greater amount being produced in glucose and lactose than in the other sugars. However, a difference was noticed in the rate of acid production, the nonimpetigo strain showing an initial "lag" for the first twenty-four hours.

*Animal Inoculations.*—In nearly every instance attempts to reproduce the disease in the skin of animals have proved a failure. Clegg and Wherry[1] observed no reactions beyond a slight hyperemia from small subcutaneous and intraperitoneal injections in guinea pigs. Falls,[2] using larger doses, was able to produce death in guinea pigs with visceral pyemia and with edema and hemorrhage of the subcutaneous tissues, but intravenous administration showed no selectivity for the skin and intradermal injections in a monkey did not produce typical lesions. Smith and Burky[3] were not able to produce lesions in the skin and cornea of rabbits with staphylococci isolated from lesions of impetigo contagiosa in children. However, Landsteiner, Levaditi, and Praser[4] produced pemphigoid lesions in chimpanzees. Our intradermal injections and cutaneous inoculations with six strains of Staphylococcus aureus, a hemolytic streptococcus, and a Gram-positive bacillus, beyond causing an occasional slight redness and scaling, did not produce typical lesions in guinea pigs and rabbits. Subcutaneous injections of small doses gave only a slight edematous inflammation in these animals.

*Human Inoculation.*—In one infant a hemolytic streptococcus and a Staphylococcus aureus were isolated, from an apparently unbroken vesicle. Cutaneous inoculations were made in another portion of the body with pure cultures of these two organisms. The staphylococcus produced a more typical and a considerably larger lesion, which in forty-eight hours appeared as a slightly indurated red area, 18 mm. in diameter, while the streptococcus inoculation gave only a small 5 mm. zone of redness with no induration, and the control merely showed a faint flush. At the end of ninety-six hours the former showed an area of denuded skin, 12 mm. in diameter, with an elevated ragged border; and the latter, a smaller area of redness and a small broken

vesicle, 3 mm. in diameter, while the control remained as before. Either lesion might represent one of the varied forms of the disease, but the staphylococcic inoculation resembled the spreading bullous type prevalent in this particular infant.

This test, for obvious reasons limited to the autoinoculation of bacteria obtained from the same infant, is open to the criticism that infection from other lesions may have occurred in the inoculated areas. The absence of any demonstrable lesion in the control inoculation and the difference between the lesions produced by the staphylococcus and the streptococcus argue against this possibility. While this test does not determine the primary cause of infection, it demonstrates that, at least in this instance, the staphylococcus was capable of producing a more rapidly progressing lesion of the bullous type than the streptococcus.

The same strain of staphylococcus was inoculated cutaneously in the forearm of an adult. In six hours a diffuse redness, 55 mm. in diameter, with a slightly indurated central portion, and an enlarged axillary gland were observed. In fifteen hours the indurated area had extended to a diameter of 55 mm., with an area of more intense redness in the vicinity of the inoculation. In forty hours the induration had subsided, but a diffuse redness persisted over an area 75 mm. in diameter. In sixty hours the induration and redness had subsided except for a slight redness at the point of inoculation. In ninety hours a less marked but similar condition was found. No vesicle formation was observed, but a slight crusting was noticed. The lesion was not typical of either the vesicular or bullous types of impetigo, but seemed to be characterized by an erythematous induration of the skin with intense itching.

Almquist[5] produced a vesicular lesion by inoculation with the impetigo staphylococcus. Clegg and Wherry produced a vesicular lesion on the arm in thirty hours which underwent resolution in forty-eight hours. Falls, by inoculating pricked skin with a broth culture, obtained, in twenty hours, a distinct vesicle from which he recovered the Staphylococcus aureus. Landsteiner, Levaditi, and Praser likewise produced vesicular lesions.

*Discussion.*—Evidence collected from many sources points to a different etiologic agent in the vesicular impetigo of children and of adults and the bullous impetigo of infants. No one has been able to demonstrate the etiologic relationship of the streptococcus to infant impetigo as has been done in the case of adult impetigo contagiosa, and there is an almost unanimous belief that the Staphylococcus aureus is the cause. The etiologic relationship of the staphylococcus in the adult form of the disease has been demonstrated by four investigators through the production of typical lesions instead of the ordinary furuncle or carbuncle infection. While the possibility of a

filtrable virus or a symbiotic relationship cannot be ruled out, the accumulated evidence seems sufficient to designate a special strain of Staphylococcus aureus as the causative agent.

Evidence indicates that the impetigo staphylococcus, except for minor cultural peculiarities, differs from the ordinary Staphylococcus aureus only in its pathogenic characteristics, and that differences exist even in the pathogenic powers of the various impetigo strains. The varied clinical symptoms, epidemic peculiarities, and differences in pathogenicity are due in part to the virulence of the infecting strains. The different symptoms in adults who have contracted the disease from infants may be explained by a difference in skin resistance, the skin of the newborn infant offering a more suitable culture medium.

In general, our findings have confirmed the work of other observers. Lesions of the disease could not be produced in animals. The typical vesicular lesion following the inoculation of the skin of an adult, described by others, was not obtained, but a skin reaction differing from the usual type of staphylococcic infection was produced. With the same organism in an infant, the peripherally spreading bullous lesions of the disease were reproduced; whereas, under similar conditions in the same patient, a hemolytic streptococcus, isolated from an impetigo lesion, produced an atypical lesion. In this somewhat limited way the comparative rôle of the staphylococcus and streptococcus as etiologic agents in infant impetigo is compared for the first time. Although the last word has not yet been said upon the etiology of infant impetigo, all the evidence up to the present time tends to designate certain strains of Staphylococcus aureus of variable virulence as the etiologic agents in infant impetigo.

## EPIDEMIOLOGY

*Hospital.*—For the purpose of determining the circumstances favorable or unfavorable to its spread, the progress of an epidemic was followed in a hospital with excellent facilities for handling the disease. The epidemic was confined to two of the three floors occupied by maternity patients. Each floor was a complete unit as regards operating, sterilizing, and delivery rooms, nursery, isolation room, and diet kitchen, with the exception that the water bottles and special food for all infants were prepared in the same kitchen. The first floor infected had three wards of seven beds, four of two and three, and two single rooms. The second comprised four large wards of nine to twelve beds and one single room.

The nursery on each floor consisted of two rooms in which metal baskets containing the infants were arranged in racks according to wards. Only the obstetrical staff and the nurses assigned to the nursery were permitted to enter these rooms. Common supplies were

used in caring for all infants. The babies were wheeled in groups to the wards for nursing. The linen was handled by the hospital laundry.

Isolation methods were established early in this epidemic. The technic employed in handling contagious diseases was enforced. The diseased and suspected infants were isolated separately under special nurses, and even those with febrile symptoms were segregated. Each infected infant was treated as a separate unit with sterile precautions. As far as possible, isolation measures were used in caring for the mothers of the infected babies.

*Course.*—The epidemic spread in spite of prompt isolation measures, indicating either delay and faulty technic or transmission by carriers. The original source of the infection was not determined. The disease first appeared as a pustular eruption on the face and neck of a two-day-old child. The second case, which developed two days later, showed similar but more extensive lesions, while the third case, developed into a fatal dermatitis exfoliativa neonatorum. The skin lesions varied from mild pustules to extensive exfoliation, a fact which rendered difficult the differential diagnosis between the mild form of impetigo and nonimpetiginous eruptions.

The epidemic lasted thirty-four days. The first four cases developed on the first floor, and the fifth case appeared on the second floor on the twelfth day. The epidemic on the first floor was most severe between the fourteenth and twenty-first days, and that on the second floor, between the eighteenth and twenty-fifth days. If we eliminate two infants with questionable diagnoses, the epidemic was confined to three wards on the first and two wards on the second floor. The incubation period was brief. The shortest interval between cases on the second floor was two days and the longest six, but on the first floor there was one interval of thirteen days which suggests transmission through carriers. The tendency of the skin to macerate during the warm weather tends to give a summer prevalence to these epidemics.

*Morbidity.*—The leading characteristics of this disease are the rapidity of transmission, the clinical progress, and the susceptibility of infants. During the period of thirty-four days, 17, or 8.5 per cent of a total of 202 infants became infected. Since the disease did not appear upon the second floor until twelve days after its appearance on the first, only 153 infants were actually exposed to the disease, thus increasing the morbidity to 11.1 per cent. However, since the distribution of the disease left certain wards unaffected, 75 cases were directly exposed, giving an actual morbidity of 22.7 per cent. Exact statistics of the morbidity rate in the various epidemics are rarely cited in the literature, but the impression of great variation is given. The average is probably between 20 and 30 per cent.

*Mortality.*—The mortality reported by fifteen investigators averages 21 per cent, and ranges from 0 to 50 per cent. Of the 17 patients in our second epidemic 2, or 11.8 per cent died. In our first epidemic the mortality was about 25 per cent, and in our third no deaths occurred.

*Human Carriers.*—Circumstantial evidence points to human carriers as the chief source of infection. The ease of surface infection and the hardy nature of the staphylococcus render the disease readily transmittible by direct contact and through true or mechanical carriers. The possible sources of human transmission are: (1) the diseased infant, (2) the mother, (3) the physician, and (4) the nurse.

Direct contact of infected and well infants may have taken place in our nursery previous to the appearance of clinical signs of the disease. The restriction of the disease to certain wards would favor either this assumption or indicate transmission through the nurse.

Certain investigators believe that the mother is the source of the disease. A mother with staphylococcic impetigo, a systemic staphylococcic infection, or even with an infected breast might be the initial cause of an epidemic, but such a carrier, through immediate isolation, could be rendered incapable of serving as a source of further transmission. Recently Mellon, Caldwell, and Winans[6] have demonstrated that mother's milk may be the source of an epidemic. Cultures of Staphylococcus aureus were obtained in milk from both the peripheral ducts and the deeper recesses of the breast in apparently symptomless mothers of infants with impetigo. None were obtained from mothers of uninfected children. Their findings emphasize the importance of isolating the mothers of infected infants. In nearly every epidemic a few mothers have been infected from the infant. In this particular epidemic, one mother developed an impetigo of the breast from the nursing infant.

In the older writings, the attendant at the delivery was considered the source of transmission, several investigators reporting epidemics traceable to midwives. In this epidemic no evidence was obtained that the obstetrician or delivery room attendants were responsible for the spread of the infection. The varied interval after birth would tend to eliminate this source.

The principal source of human transmission is the nurse. In the nursery she is in constant, intimate contact with the infants and serves as a means of mechanical transmission even if not a true carrier. Although in the epidemic under discussion suspected infants were immediately isolated, transmission through this source had been already accomplished. The outbreak of the epidemic on the second floor twelve days after that on the first floor followed closely the transfer of a nursery nurse from the first to the second floor. Secondary in-

fection of the hands and arms of nurses from infants has been observed in other epidemics.

*Inanimate Objects.*—The vitality of the staphylococcus, and its normal habitat on the skin and upon inanimate objects, render easy the transmission of the disease and permit inanimate objects to play a more important rôle in its distribution than in that of most communicable diseases. When the infants entered the ward for nursing, they were exposed only to the environment of their respective mothers. Unless an infected mother, in whom the disease had escaped recognition, was able to contaminate directly or indirectly other mothers, the ward offered comparatively little chance for this means of transmission. At nursing time several infants were removed from their baskets and wheeled on a carriage to the ward, thus affording opportunity for personal contact and contamination of the carriage coverings.

The clothing and bedding of the infants were laundered with no special measures for sterilizing, since the process in itself should be sufficient to destroy the staphylococcus. The final handling of the linen by laundry attendants was a possible, though improbable, source of infection. The water bottles and formula feedings were prepared in one place for the entire service, but as sterile precautions were used and most infants were breast-fed, this source was unlikely.

The utensils for handling the infants in the nursery, such as bathing tables, basins, oil, dressings, etc., presented the most favorable opportunity for the transfer of infection by inanimate objects. The labor of caring for from thirty to forty children was so great that routine sterile precautions among the infants were impossible, and under the pressure of rush work, the transfer of infection both through the nurse and through nursery material might readily occur. The wide distribution of ordinary staphylococci rendered practically impossible any bacterial determination of the inanimate sources of infection.

*Discussion.*—The causative agent, the staphylococcus, is a hardy organism capable of leading for long periods a saprophytic existence on resistant skin and upon inanimate objects. Owing to lack of resistance, the skin of the newly born infant presents a fertile soil. In bacterial cultures a few organisms will develop on favorable media, whereas, the implantation of many thousand times that number are required for a less favorable media. A similar comparison in respect to the ease of and reaction to infection with the impetigo staphylococci may be made between the skins of the infant and the adult. With such favorable conditions for infection in the infant, many means of transmission of this viable organism are afforded.

Human agency appears the most frequent source of transmission. The primary source may be a mother who is a carrier. Our evidence points to the spread of the infection in the nursery directly or indirectly through the nurse, who acts chiefly as a mechanical carrier.

The spread of the epidemic from the first to the second floor nursery followed the transfer of a nurse. The possibility of true carriers among the nurses or attendants must always be considered, but their detection is most difficult.

An object which comes in contact with the lesions furnishes a means of transmitting infection to healthy infants. The common utensils used in the daily care of the infants afford the most likely sources. No evidence is found to indicate the transmission through prepared food, water, or freshly laundered clothing.

Since the resistance of the infants, except for racial and individual variation, should prove the same, our observations and those of others indicate a marked difference in virulence in the strains of the infecting organism. The first epidemic in our hospital showed an extremely rapid spread, a devastating clinical picture, a high mortality, and necessitated the closing of the hospital. The second proved of a less virulent type, while the third showed a mild, yet typically clinical form of the disease with no fatalities.

*Prevention.*—The institution of prophylactic measures depends upon the facilities of the hospital as regards equipment and nurses. The rapid isolation of diagnosed and suspected cases in two groups with special nurses is the ideal method. Practically, limited facilities may necessitate the isolation of suspected and diagnosed cases in one group. The special nurses employed in the care of the infected infants should have no direct or indirect contact with other nurses. Frequent inspection of well infants should be made to guarantee the prompt isolation of all suspects. If the disease persists in spite of isolation measures, no new patients should be received unless complete separation from the old patients is possible.

After the disease has broken out, the primary prophylactic measure is the proper handling of the healthy rather than the care of the infected infants. A thorough cleansing and disinfection of the nursery should precede the individual handling of the infants, since the staphylococcus is capable of transmission through various objects, and it may be widely distributed before the disease is recognized. With the possibility of new cases continually appearing, each healthy infant should be handled, in so far as possible, as a separate unit, especially as regards the common nursery supplies. Theoretically, the ideal method would be the use of the same precautions as in handling patients with infectious diseases. Practically, scarcity of labor renders such a procedure impossible in most hospitals and only the more important precautions, such as cleansing and sterilizing the gloved hands of the nurse before handling each infant, and the avoidance of contact with the same materials by the different infants can be followed.

In order to eliminate a possible source of infection, the mothers of infected infants should be isolated. The question of breast or artificial

feeding depends upon the individual case. When a special isolation ward is not available, contagious disease precautions for each mother should be maintained. The care of the infected infants, especially if suspected cases are not separately isolated, should follow the same precautions as outlined for the well infants. Each infant should be handled with full contagious disease precautions. All linen from the infected nursery should be sterilized before it is sent to the laundry. Bottles used for infected babies' food and drink should be sterilized and prepared separately from the regular supply.

## SUMMARY

1. Our observations corroborate the opinion of the previous investigators who find that a strain of Staphylococcus aureus of special virulence is the etiologic agent in impetigo contagiosa neonatorum.

2. A pure culture of Staphylococcus aureus isolated from an impetigo lesion failed to produce skin lesions in guinea pigs and rabbits. The same culture caused a nonvesicular inflammatory reaction in the skin of an adult and a typical exfoliating lesion in an infant from whom the organism was originally isolated. A hemolytic streptococcus isolated from the same infant produced only a small atypical lesion.

3. The cultural characteristics of the impetigo staphylococcus are practically the same as those of the ordinary staphylococcus. A questionable minor difference in the rate of carbohydrate fermentation is recorded.

4. The viability of the staphylococcus makes the disease transmissible through both human beings and inanimate objects, and renders disinfection of an infected hospital especially difficult. In the epidemics under observation it is probable that the transmission of the disease occurred chiefly through the nurses and the nursery supplies.

5. The variation in the different epidemics is due probably to a difference in the virulence of the infecting strain. The difference in clinical symptoms between adults and children or in individual infants seems to be due to the resistance of the host.

6. The primary prophylactic measure in a hospital epidemic is the individual handling of the well infants, as early cases are capable of transmitting the infection before a diagnosis is made.

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80 East Concord Street.

# ELIMINATION OF THE SECOND STAGE OF LABOR IN BREECH PRESENTATIONS

By Frederick C. Irving, M.D., and Thos. R. Goethals, M.D.,
Boston, Mass.

*(From the Department of Obstetrics, Harvard Medical School)*

IT is a recognized fact that breech presentations offer a relatively unfavorable prognosis for the baby. Statistics from various sources give the fetal mortality as 6, 10, 15, or even 20 per cent, the last, quoted by Hirst, to include badly managed cases in general practice. Recent statistics from the Sloan Maternity Hospital show a mortality at that clinic of 12 per cent in primary breech presentations. De Lee, who gives 6 to 15 per cent as a general mortality figure, believes that this should not exceed 5 per cent in uncomplicated cases.

Several factors are contributory to natal and neonatal deaths in breech deliveries. Violence and trauma of unphysiologic extraction are considered as outstanding causes by Crothers, an opinion in which he is supported by Pierson. These observers believe that injury to the vital centers in the medulla is the usual cause of death in stillborn viable fetuses, and that the occurrence of such injury is favored in breech presentations by traction on the body or by suprapubic pressure on the aftercoming head.

Other factors, however, are present in breech presentations which render them more dangerous to the fetus than vertex presentations. Most important is disproportion between the baby and the maternal pelvis. If such disproportion is suspected the obstetrician finds that several very valuable methods of comparison between baby and pelvis, which are of the greatest importance when the vertex presents, are unavailable. Under the circumstances the engagement of the head before labor and Müller's method of impression are obviously out of the question, and even a test of labor will give no clue as to the probability of the baby's head passing uninjured through the pelvis. Consequently the only means of prognostication are reduced to measurement of the pelvis and estimation of the size of the baby at term, of which only the former is an accurate determination. This means that regardless of the progress of labor, or the skill and gentleness of extraction, a certain proportion of babies must be lost as a result of mechanical difficulties in delivery of the aftercoming head, which has had no opportunity to become moulded into the pelvis during labor, and the size of which, relative to the pelvis through which it must eventually pass, can never be accurately ascertained until the act of delivery is in its final stages. Cases of marked disproportion discov-

ered in this way must necessarily carry a high fetal mortality without regard to whether the death of the child is due to asphyxia or to the trauma of extraction. For the same reason accouchement forcé in breech presentation is apt to result in mechanical difficulty in delivery of the aftercoming head with a consequent bad risk for the baby.

Aside from the danger element of disproportion, presentation of the breech results disadvantageously to the fetus in several respects. In the first stage, the relative lack of accommodation of the breech to the birth canal favors premature rupture of the membranes, and does not afford a mechanically sufficient dilator of the os. The result is a

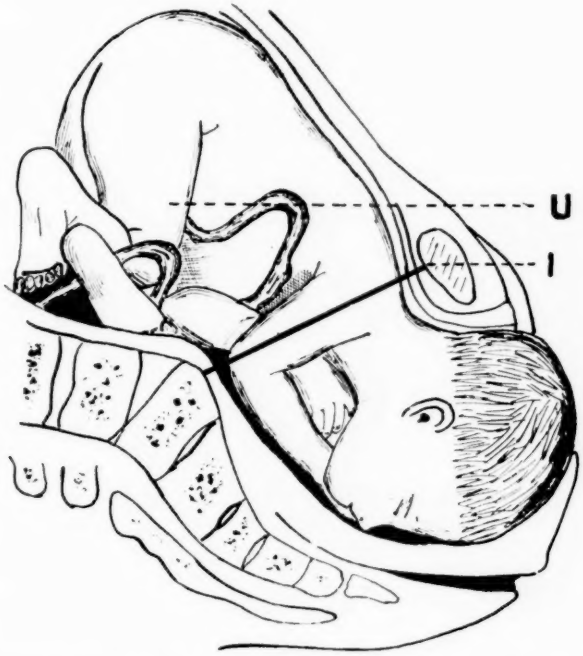


Fig. 1.—Demonstrating that in a vertex presentation which is on the perineum, the umbilicus (*U*) of the fetus is still well above the superior strait (*I*), consequently the umbilical cord is less likely to be subjected to pressure than in a breech presentation which has descended to a like degree.

tendency for such cases to undergo a long and tedious first stage, and in many instances to delay the actual onset of labor for some time after the membranes have ruptured.

Figs. 1 and 2 illustrate another factor which renders the breech presentation more dangerous to the child than the occipital. As a general rule many breeches remain high above the pelvic brim or but lightly engaged until full dilatation of the os has occurred; as soon, however, as this barrier is out of the way, descent ensues. In this process the cord may be compressed either between the breech and the pelvic brim or between the thigh and the body of the fetus. The

fact, above mentioned, of the poor accommodation of the breech to the shape of the birth canal favors such compression by allowing the cord not infrequently to prolapse partially or completely. Needless to say such compression can always be suspected and eventually proved, if careful watch of the fetal heart is kept at all times, especially during the second stage.

Another danger to the baby during the second stage lies in the tendency of the uterus to empty itself of the greater bulk of its contents, viz., the legs, body, and arms of the fetus, shortly after full dilatation has occurred. The result of this sudden shutting down of the uterus upon the relatively small bulk of the head occasionally causes a rapid

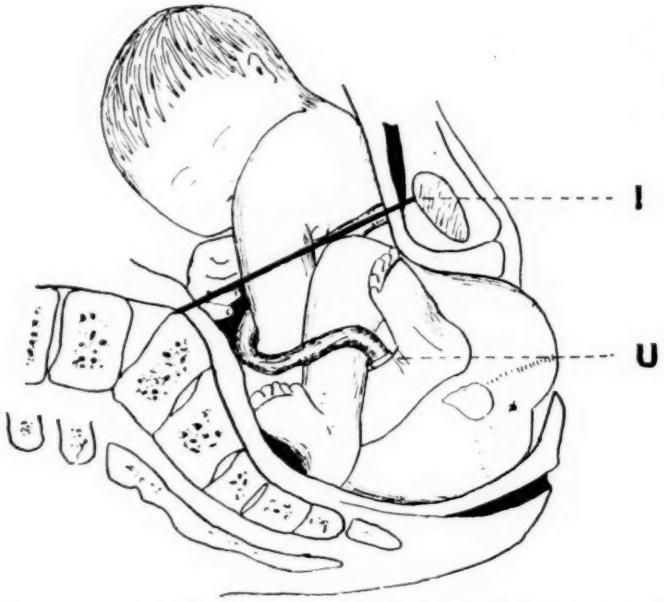


Fig. 2.—Demonstrating that in a breech presentation which is on the perineum, the umbilicus (*U*) of the fetus is well below the superior strait (*I*). Thus the umbilical cord may easily be subjected to pressure and asphyxia result. Hence, the inadvisability of delay in delivery, once the breech has reached the pelvic floor, is apparent.

and complete detachment of the placenta with consequently speedy death of the baby from asphyxia unless the situation is met with immediate extraction.

Finally, the baby is jeopardized during actual expulsion from the vagina. For years it has been accepted that death from asphyxia is almost inevitable if the head be not delivered within eight minutes after the appearance of the umbilicus at the vulva. Although this view is challenged by Pierson and others, and although it may not be quantitatively applicable for all cases, it ought to be taken to mean that delivery should be completed intelligently and gently and as rapidly as possible after the umbilicus appears, rather than leave the

case to nature. It is the exception rather than the rule to find the cord pulsating when the umbilicus appears, because at this stage the cord is usually compressed between the baby's head and the pelvic brim; therefore, eventually and relatively soon, the baby is certain to perish unless an airway is established and the lungs given opportunity to function.

A study of fetal mortality in primary breech presentation as shown by the records of the Boston Lying-In Hospital for the ten year period from 1914 to 1923 inclusive is one of the main objects of this paper; the other is to summarize the conclusions to be drawn from one year of special assignment work on the subject of breech deliveries. The figures to be presented are derived from the deliveries of single viable babies presenting as primary breeches, uncomplicated by incidental conditions which in themselves tend to a high fetal mortality, e.g., placenta previa; they exclude natal and neonatal deaths from such causes as maceration, nonviability, prematurity, and congenital anomalies incompatible with life or continuance of life. They also exclude breech deliveries in multiple pregnancy.

The ten year series yields 235 primary breech deliveries with 23 deaths, a mortality rate of 9.78 per cent. These are divided between 94 primiparous deliveries with 12 deaths, a 12.7 per cent mortality, and 141 multiparous deliveries with 11 deaths, a rate of 7.8 per cent. The figures are given in Table I.

TABLE I

DELIVERIES AND DEATHS

| YEAR | PRIMIPAROUS | | | MULTIPAROUS | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | DELIVERIES | DEATHS | PER CENT | DELIVERIES | DEATHS | PER CENT | DELIVERIES | DEATHS | PER CENT |
| 1914 | 9 | 2 | 22.2 | 7 | 0 | 0 | 16 | 2 | 12.5 |
| 1915 | 12 | 1 | 8.3 | 6 | 2 | 33.3 | 18 | 3 | 16.6 |
| 1916 | 8 | 1 | 12.5 | 19 | 0 | 0 | 27 | 1 | 3.7 |
| 1917 | 11 | 0 | 0 | 15 | 1 | 6.6 | 26 | 1 | 3.8 |
| 1918 | 8 | 1 | 12.5 | 11 | 1 | 9.1 | 19 | 2 | 10.5 |
| 1919 | 6 | 0 | 0 | 15 | 2 | 13.3 | 21 | 2 | 9.5 |
| 1920 | 6 | 3 | 50. | 17 | 3 | 17.6 | 23 | 6 | 26. |
| 1921 | 12 | 1 | 8.3 | 16 | 1 | 6.2 | 28 | 2 | 7.1 |
| 1922 | 9 | 0 | 0 | 17 | 0 | 0 | 26 | 0 | 0 |
| 1923 | 13 | 3 | 23. | 18 | 1 | 5.5 | 31 | 4 | 12.9 |
| Totals | 94 | 12 | 12.7 | 141 | 11 | 7.8 | 235 | 23 | 9.78 |

The 23 natal and neonatal deaths may be classified as follows:

Group A. Mechanically easy delivery with neonatal death from intracranial hemorrhage.

Group B. Mechanically easy delivery with resulting stillbirth, or birth of a child in very poor condition with ensuing exitus.

Group C. Mechanically difficult delivery.

Group A includes six cases in which delivery was described in the records as being easy of accomplishment, but following which the

babies died after several hours or days, with clinical signs of intracranial hemorrhage; in two of these cases the diagnosis was confirmed at operation; in one, at autopsy. Cases in this group may well be compared to those children born by a normal spontaneous vertex delivery who die occasionally in a similar manner hours or days after birth.

Group B includes those babies born spontaneously by the breech or by extraction where no mechanical obstruction or difficulty existed, but who were either stillborn or born in such poor condition that attempts at resuscitation were fruitless. These cases, viewed together, are very instructive, and justify a summary. They are eight in number.

No. 21702.—Para ii. Labor was induced with castor oil and quinine. No record of fetal heart sounds for some hours before delivery, although it was present at time of rupture of membranes. The patient was unruly and pushed breech out of vulva before arrival of house officer. She was scrubbed and delivered at once without difficulty. The baby weighed six pounds and six ounces. Stillborn.

No. 25307.—Para ii (essentially primipara). Flat pelvis. Fetal heart was heard at 140 and regular, forty minutes before delivery. Breech on perineum. Easy extraction. Baby weighed six pounds, eleven ounces. Child rigid, gasped once, and grew pallid; resuscitation unsuccessful.

No. 26523.—Primipara, forty-one years old. Toxemic. Bag inserted. Breech allowed to crown after full dilatation. Fetal heart 140, regular, forty-two minutes before delivery. Easy extraction after crowning. Baby stillborn.

No. 25821.—Para iii. First delivery by cesarean section; second by version. Patient allowed to go into labor. Fully dilated for over an hour. Fetal heart fell to 90 and became irregular. High breech. Easy extraction of a nine pound child which could not be resuscitated.

No. 26867.—Para iv. Justo minor pelvis. Ruptured membranes five hours before labor started. Fetal heart sounds recorded at intervals until twenty-two minutes before delivery. Breech presenting, delivered; cord found compressed and caught by left leg; freed; did not pulsate. Immediate delivery. Stillborn.

No. 26899.—Para v. Normal pelvis. Ruptured membranes twenty-four hours before onset of labor. Fetal heart irregular from the start,—80 to 180. Bag inserted, came out in two hours and a quarter. Os found fully dilated. Extraction easy within five minutes and a half of grasping foot. Stillborn.

No. 26972.—Primipara. Slightly funnel-shaped pelvis. Pushed frank breech to perineum. Fetal heart heard seventeen minutes before delivery. With breech on perineum, fetal heart sound was suddenly lost. Immediate extraction. Baby pallid, and could not be resuscitated. Placenta fell out on top of baby.

No. 27074.—Para v. Under antiluetic treatment. Normal pelvis. Fetal heart heard on admission, could not be heard an hour later. Prepared for immediate delivery. Breech on perineum. Easy extraction. Baby weighed three pounds and three ounces. Heart never beat.

Five of these Group B cases are of interest as showing the occurrence of death at some time during the expulsive stage, one with a discovered compression of the cord, and one with an evident prematurely separated placenta. These deaths were in a measure avoidable in that, had the expulsive stage been shortened or done away with by

earlier extraction, some of them, at least, would not have occurred. Two of the remaining three showed fetal distress by variation in the rate and rhythm of the heart, and were treated by extraction; yet the child in Case 25821 might well have survived had extraction been undertaken earlier.

Group C comprises nine cases, in all of which delivery was mechanically difficult.

No. 21172.—Primipara. Sent in from O.P.D. where she had been in labor two days, and where she had had bag inserted. Three fingers dilated on arrival, with cervix taken up. Because of mother's poor condition dilatation was completed manually. Cervix shut down on the aftercoming head. Baby stillborn.

No. 21909.—Primipara. Flat pelvis. Cesarean section was considered. Three hours in second stage with fetal heart heard. Breech low-midpelvis. Extraction done, left arm extended, brought out with clavicle fractured. Forceps to aftercoming head. Baby weighed seven pounds. Died five minutes after delivery.

No. 24221.—Primipara. Justo minor pelvis. Both labia large,—size of fists, and vaginal mucous membrane very tough and leathery. Os fully dilated. Vagina torn when dilated, packed, episiotomy done, feet brought down. Left arm behind head. Baby stillborn with fractured left shoulder.

No. 26280.—Para v. Justo major pelvis. Ruptured membranes about 7 P.M., but did not start in labor; bag to be inserted in morning. Cervix on examination thought to be easily dilatable. Dilated manually. Baby's arms extended. Forceps to aftercoming head. Stillborn. Weighed eight pounds and eight ounces.

No. 26378.—Primipara with flat pelvis, promontory by rectum easily felt. Cesarean section decided against because patient had temperature of 101. Fully dilated. Extraction done; head was caught at superior strait, and was pushed through only with difficulty. Baby weighed six pounds, four ounces; stillborn.

No. 28235.—Primipara with diagonal conjugate of 10.5 cm. Fetal heart heard up to four hours before delivery, no later record. Manual dilatation and extraction for lack of progress. Arms delivered without difficulty. Some difficulty in delivery of head. Baby stillborn, weighed seven pounds, two ounces.

No. 30048.—Difficult delivery of eleven pound, four ounce baby after thirty-six hours of labor and long-standing rupture of membranes. Tight uterus, flat pelvis.

No. 30127.—In labor twenty-four hours with ruptured membranes. Cervix three fingers dilated, frank breech, cord prolapsed. Manual dilatation and extraction. Head stuck in cervix, delivered with difficulty. Baby died two hours after birth.

No. 30863.—Difficult extraction after full dilatation.

Group C is of particular interest as showing the danger to the child of a manual dilatation immediately preceding breech extraction. Inasmuch as artificial dilatation of the cervix can never be as effective as the natural, it seems superfluous to urge that the former should be done only in those cases where stringent indication exists for immediate delivery in the interest either of the mother or of the child.

Because of the high fetal mortality rate at the hospital for the year 1920, we were given the special assignment of all breech deliveries for a twelve month period beginning March 1, 1921. Whereas, previous to this period breech cases had been handled routinely by the staff member on service or by the house officers acting under his direction,

it was felt that if a definite method of delivery were followed under strict supervision, the fetal results might be improved. Therefore, during the time of the assignment all primary breech deliveries were conducted by or supervised personally by us. The routine method of procedure was in outline as follows:

1. Careful auscultation of the fetal heart throughout labor.
2. Policy of "hands off" during the first stage, except when, because of lack of progress after rupture of the membranes prematurely, a Voorhees bag was inserted to aid dilatation or to stimulate efficient uterine contractions.
3. Immediate extraction after full dilatation.

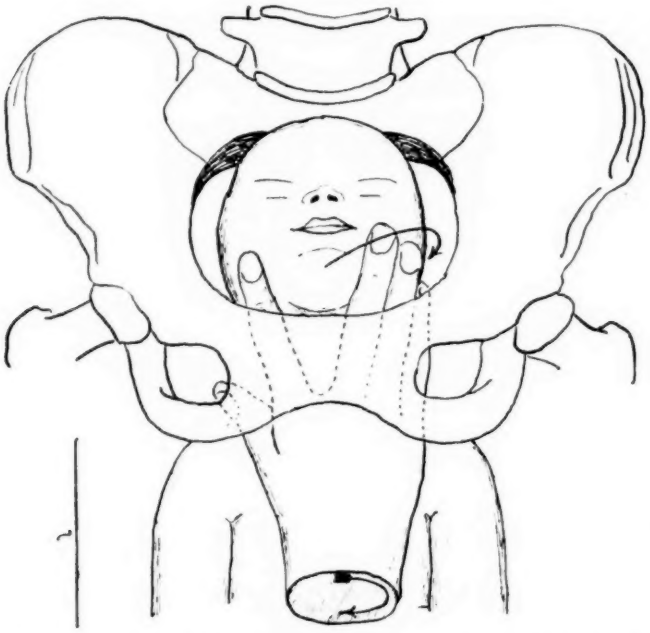

Fig. 3.—The best method of delivering the aftercoming head when the face has rotated anteriorly. The chin is grasped between the index and middle fingers of the operator and rotated posteriorly. The index finger is then inserted in the mouth of the fetus, the head flexed, and delivery effected in the usual manner.

The technic of extraction included the freeing and bringing down both feet by the Pinard maneuver, in the cases of frank breech; the keeping of the baby's back anterior until the scapulae were well down in sight; the delivery of the arms anteriorly under the symphysis, one after the other; and the delivery of the head either by Mauriceau's maneuver combined with suprapubic pressure, or by application of forceps in the occasional case. The bringing down of one arm before beginning the extraction was done in several of the cases, and the hand held down alongside of the baby's hip by means of a fillet around the wrist. This maneuver may be of value in the case of an overlarge baby, but is of no advantage as a routine method. We believe that better results are obtained if the posterior rather than the anterior

arm is thus secured. In one of the cases the head rotated in the pelvis after the body had been delivered, bringing the chin to the pubis; in this case the method of rotation illustrated in Fig. 3 was of great value.

The result of the cases delivered on this assignment was as follows:

TABLE II

| | DELIVERIES | DEATHS | MORTALITY PER CENT |
|---|---|---|---|
| Primiparas | 13 | 1 | 7.7 |
| Multiparas | 17 | 1 | 5.8 |
| Total | 30 | 2 | 6.6 |

One of the deaths occurred in the case of a primipara with a diagonal conjugate of 10.5 cm., in which manual dilatation and extraction were done for lack of progress. The head was delivered with difficulty and the baby was stillborn. The other was in the case of a multipara in which a slow methodical extraction was done "without complication or mishap," following which the baby died on the third day of intracranial hemorrhage.

Although the assignment lapsed on March 1, 1922, the method of procedure was followed in the main throughout that year and has been used in a large proportion of the cases subsequently. The deaths since the assignment ended have been one case of Group A and three of Group C. A comparison of fetal mortality rates during the ten year period as existing before and after the beginning of the assignment shows:

TABLE III

| | PRIMIPAROUS | | | MULTIPAROUS | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | DELIVERIES | DEATHS | PER CENT | DELIVERIES | DEATHS | PER CENT | DELIVERIES | DEATHS | PER CENT |
| Before | 61 | 8 | 13.1 | 93 | 9 | 9.7 | 154 | 17 | 11. |
| After | 33 | 4 | 12.1 | 48 | 2 | 4.1 | 81 | 6 | 7.4 |

For purposes of comparison Table III is inserted to show the fetal mortality following delivery by methods other than breech extraction. The cases have been selected in series from the pathologic index of the hospital records, and, wherever feasible, to the number of 235.

The figures given in Table IV indicate that breech presentation deserves its reputation for jeopardizing the baby. They indicate that breech deliveries entail a higher fetal mortality than any form of

TABLE IV

| | DELIVERIES | DEATHS | MORTALITY PER CENT |
|---|---|---|---|
| 1. Normal deliveries during years 1916 and 1920 | 920 | 9 | 0.97 |
| 2. 235 low forceps deliveries beginning 1916 | 235 | 3 | 1.27 |
| 3. 235 mid forceps deliveries beginning 1916 | 235 | 14 | 5.95 |
| 4. All high forceps deliveries 1916 to 1923 incl. | 134 | 19 | 14.18 |
| 5. 235 abdominal cesarean sections beginning 1916 | 235 | 2 | 0.85 |

delivery by the presenting occiput save the operation of high forceps. Therefore, the method of conversion of the breech presentation into a vertex by external version deserves at least a trial if the case is recognized either before labor starts or early after it has begun. We believe, with Crothers and the Sloan group, that rough handling of the baby during breech extraction may and often does cause death from direct or indirect trauma. We believe, however, that if the case in which a breech presents is deemed suitable for delivery via the pelvic route the baby should be extracted as soon as full dilatation of the os has occurred, rather than be submitted to the dangers resulting during the second stage from compression of the cord and from premature separation of the placenta.

443 Beacon Street

## POSTOPERATIVE PAROTITIS WITH A REPORT OF CASES*

By Thomas C. Peightal, M.D., New York, N. Y.

ACUTE pyogenic parotitis, though occurring rarely as a distinct entity in healthy individuals, somewhat more frequently in a recurrent form, due to duct obstruction from stone, mucus, injury and other causes, and still more frequently in cases of acute, general infection, or in states of debility due to wasting diseases, is not altogether uncommon as a postoperative complication. As practically every surgeon has, at some time in his experience, encountered this last type of parotid infection, a brief report of several cases, with remarks concerning the possible etiology, may be of interest here.

During the past four years, nine such cases have occurred in the operative services at the Roosevelt Hospital,—six of these recently, within a period of five months, previous to which time there had been a free interval of almost three years. Five of the cases are from the gynecologic service, and two cases each from the two surgical services. They naturally fall into three groups: mild, moderately severe, and severe, and may be briefly described as follows:

Case 1. Mrs. I. M. G. (C13319), widow, aged fifty-nine was operated upon December 31, 1924, under general anesthesia, receiving 2400 mg. hours of radium, for carcinoma of the cervix. On January 16, 1925 she received 1000 mg. hours in the vaginal vault, without anesthesia, and on January 22, a third application of 1500 mg. hours, in the upper cervix again under general anesthesia. On the sixth day after the last procedure the temperature rose from normal to 103° F. and there was moderate bilateral swelling of both parotids, which subsided spontaneously under cold applications in about five days.

*Read by invitation before the New York Obstetrical Society, May 12, 1925.

CASE 2. Mrs. D. K. (C13350), aged thirty-two, was operated upon February 20, 1925, an extensive myomectomy for fibroids. Several hours afterwards the patient required an infusion of 1000 c.c. of saline solution, after which she had a chill and temperature rise to 106°, dropping within three hours to 101°. The following day a moderate, bilateral parotitis developed, which subsided rapidly in three days. Further recovery was uneventful.

These two cases are characteristic of a mild type of parotitis, which is probably due to some type of temporary duct obstruction, either mucus or swelling of the papilla, rather than from a diffuse inflammation of the gland elements. It would seem that such cases are of more frequent occurrence than is generally supposed, for they may be readily overlooked, particularly if the local swelling is only of moderate size. They usually subside rapidly within a few days.

CASE 3. Mrs. M. B. (C13240), aged twenty-six, was operated upon in October, 1924 for bilateral tuboovarian abscess, a complete abdominal hysterectomy and appendicectomy being done. On the third day after the operation the patient developed a right parotitis, with temperature of 104°. This was treated with ice, and mouth wash, and by the seventh day the temperature was down to 99°. The local condition subsided very slowly without suppuration, and three weeks later a small bleb, containing a drachm of seropurulent fluid appeared just below the right ear. This was incised, and apparently did not communicate with the gland, which receded gradually to normal, four weeks after onset.

CASE 4. Mrs. C. B., aged thirty-three, was operated upon April 11, 1925, cholecystectomy, with drainage. On the tenth day she developed a right pleurisy and the temperature rose to 103°. The patient was quite ill, and on the twelfth day, after x-ray, 50 c.c. of serosanguineous fluid was aspirated from the right chest. On the fourteenth day it was thought that a subdiaphragmatic abscess might be present so, after transfusion and exploration with needles under a general anesthetic without obtaining pus, the abdominal wound was explored. No exudate was found, and a small collection of old blood-clots was removed. On the night of the third day after this last procedure, the patient developed a left parotitis, which involved the whole gland. Under treatment with ice, fluctuation did not develop, and to date, sixteen days after its onset, the gland appears almost normal.

CASE 5. Miss M. D. (C10929), aged fifty-nine, menopause ten years previously, was operated upon in November, 1921, for adenocarcinoma of the fundus, a complete abdominal hysterectomy being done. The appendix was not removed. On the fourth day after operation with a temperature of 104°, she developed a bilateral parotitis, which was treated with ice. No fluctuation developed and the induration subsided very slowly. Eighteen days after the onset, a small, superficial skin bleb containing about one-half a drachm of pus, was incised just in front of the left ear. It did not communicate with the parotid tissue. Two weeks after this a similar bled was incised in front of the right ear. Five weeks after onset both glands had returned to normal, and the patient was discharged.

CASE 6. Miss J. I. W. (B13814), aged fifty-two, was operated upon January 27, 1921, for duodenal ulcer and gallstones. She had a cholecystectomy, posterior gastroenterostomy, and appendectomy. There was a moderate postoperative reaction and the patient was doing well until the fifth day, when the temperature rose to 101°, and swelling was noted in the right parotid gland. Three days later there was a definite lobar pneumonia of the right lower lobe, and four days after that

the patient rapidly failed and died. There was no fluctuation in the parotid, and pneumonia was considered the cause of death.

CASE 7. Miss L. V. (C10850), aged thirty, was operated upon in October, 1921, a rather extensive myomectomy being done. The appendix was routinely removed. The course was uneventful, and the patient was out of bed on the fourteenth day. On the sixteenth day the temperature suddenly rose to 103° and a unilateral parotitis was noted. The wound showed no evidence of induration, and the pelvis was normal. By the twenty-first day the parotitis was subsiding under local treatment with ice and mouth wash, when the temperature again went up to 102°. Several days later a small abdominal wall abscess was opened at the lower angle of the wound, and the temperature rapidly subsided to normal on the thirtieth day.

The interesting feature here was the unusually late appearance of the parotid infection, and the subsequent development of a wound abscess. The latter, often obscure for a time, might have antedated the parotid involvement and, to those who accept the metastatic etiology of parotitis, this may seem an excellent example. However, a careful study of the observations, made at that time, indicates that the parotitis definitely preceded the wound infection.

These five cases just described (3 to 7) may be termed moderately severe in that they do not subside within a few days and that the infection usually becomes general throughout the whole gland but does not proceed to active suppuration or abscess formation. After the first few days the pain disappears, and the massive induration, which subsides very slowly, is the chief characteristic. The blebs mentioned above are, no doubt, most frequently due to continued ice application. Some advocate opening this type of gland, but without fluctuation this would seem unnecessary. However, should such a process appear elsewhere on the body than the face, incision and drainage would, no doubt, be more frequently practiced.

CASE 8. Mrs. A. K. (B.20646), aged forty, was operated upon January 3, 1925, for fibroid uterus, a complete hysterectomy and routine appendicectomy being done. The procedure was somewhat prolonged and difficult due to a large fibroid situated low in the cervix. The immediate postoperative reaction was marked, temperature 103 to 104°, pulse 120 to 130, and the patient required hypodermoclysis on two successive days, during which time the fluid intake by mouth was practically nothing. On the sixth day an abdominal wound abscess was opened and contained B. coli. Twenty-four hours later, on the seventh day, a bilateral parotitis began and was treated with ice and mouth wash. For a time the gland inflammation seemed stationary, and it was thought it would recede; but, on the seventeenth day—ten days after onset—fluctuation was noted, and both sides were opened by horizontal incision under novocaine, at the most dependent point for drainage. Culture showed Staphylococcus aureus. A week later a partial paralysis of the right seventh nerve developed. Four weeks after incision, both parotid wounds were healed and the patient left the hospital, but the facial paralysis was unimproved. Two months after incision she was seen at recall. The scar formation was slight and the paralysis had entirely disappeared.

CASE 9. Mr. J. H., aged thirty-five, was operated upon for duodenal ulcer on April 15, 1925, an excision of the ulcer with Horsley type of pyloroplasty and appendicectomy being done. He was put on a gastroenterostomy diet with rectal

glucose only for twenty-four hours, then water in drachm doses every two hours, gradually increasing. On the fifth day the temperature which had been 100° went up to 103°, and a right parotitis developed which was treated with ice and mouth wash. The gland was moderately swollen and an abscess ruptured into the external auditory canal four days later, even before fluctuation could be made out externally. A horizontal incision, one and a half inches long, was made just below the angle of the jaw, on the tenth day, and the abscess opened bluntly with a clamp. Culture showed Staphylococcus aureus. The temperature became normal six days later, the gland subsiding rapidly. The abdominal wound remained clean.

These two cases illustrate the more severe type of this complication where suppuration takes place and incision is necessary. Fortunately we have no example in this group, of the acute gangrenous type which causes sloughing of almost the entire gland and very often, in spite of incision, ends fatally.

*Prognosis.*—The mortality in those cases requiring incision is uniformly considered in the literature to be about 30 to 33 per cent but in many instances these figures are rendered inaccurate by the fact that the original condition for which operation was performed is often a definite factor in the mortality.

*Diagnosis.*—The diagnosis of postoperative parotitis is usually an easy matter. Sudden rise of temperature, pain in the neck and ear, followed by red, tender swelling of the gland is seldom missed, especially after abdominal or other operation, remote from the involved region. However, if the operative field be near by, one must differentiate this condition from lymphadenitis and cellulitis; for the gland itself can be masked by edema, and early rupture of the capsule with extension downward along the cervical tissues may make the problem of diagnosis more difficult. Then, of course, the possibility of epidemic parotitis must always be kept in mind.

Inspection of the papilla of the duct opening opposite the second molar tooth will usually show swelling and redness, while frequently a drop of pus may be expressed from the mouth of the duct by gentle pressure on the gland. Spurling and Stewart, in reporting four cases of primary pyogenic parotitis in otherwise healthy individuals, call attention to the fact that the duct opening may appear normal. They advise catheterizing it with a small glass pipette, and if examination reveals many leucocytes on smear and a practically pure culture of one of the usual organisms, the diagnosis is proved.

*Bacteriology.*—Staphylococcus aureus is generally conceded to be the most frequent causative agent. In each of the two incised cases reported, this organism was obtained in pure culture. The consensus of opinion varies as to the frequency with which other organisms are found, but most writers usually mention the pneumococcus, the streptococcus, and the colon bacillus, in the order named.

*Occurrence.*—This type of parotitis occurs most frequently in adults, and most writers observe a greater incidence in females than in males. Blair, in a recent monograph, says that pyogenic parotitis is observed more commonly in the third decade, in females, and that the great majority of his cases occurred between the months of November and April, when respiratory infections are more prevalent. He found bilateral involvement in 20 per cent of the cases, while Dyball, at an earlier date, placed this figure at 33 per cent. In those cases reported, 44 per cent were bilateral, all occurred between October and March, and eight of the nine were in women.

*Course.*—The course of this complication varies greatly from the very mild cases, with little fever and swelling subsiding in a few days, to the severe suppurative type requiring incision, and from five to six weeks for regression. In the series just given, the shortest time was three days and the longest four weeks. Pneumonia, in varying degrees is the most frequently observed complication in this course. The case referred to which ended fatally may be an illustration.

Suppuration without incision usually results in spontaneous opening through necrosis of the overlying fascia and skin, or frequently into the external auditory canal, the temporal fossa, or the pharynx, with occasionally a resultant gangrene of the entire gland.

*Treatment.*—It must be emphasized that all observers are in accord upon the treatment of this condition. Cold applications, usually ice, with frequent mouth wash and mastication exercises to promote salivary flow, are used in the early stages and may suffice for the milder cases. However, some writers prefer heat to cold and report excellent regression from its use.

If close observation reveals that the general symptoms are becoming worse and the local inflammation is rapidly extending, incision is indicated, even before frank fluctuation is noted, because the parotid is surrounded by a particularly tough capsule and, therefore, gangrene develops with extreme rapidity.

Blair says that one should open the gland, in doubtful cases, not later than the second twenty-four hours, and that delay is far more serious than to incise needlessly. He points out that the same rules govern here, as in acute appendicitis. Similar opinion is held by Lilienthal, Fisher, Lynn, LeDentu, Fantozzi, and practically every surgeon who has reported cases. It will be noted in one of the cases reported above, that spontaneous rupture into the external auditory canal occurred, within four days after onset.

There are slight differences as to the type of incision. Blair, Lilienthal and Fisher have each described incisions which are vertical, quite extensive and differ but little in location. Approximately, they begin just below the zygoma, and pass downward close to the ear, to reach

a point just behind and below the angle of the jaw, from which point further extension is carried slightly forward, not further than the anterior border of the masseter muscle. Fisher adds a small Y-shaped extension from just below the ear, upward and backward over the mastoid to open this portion of the gland. Wagner and Jennings have used a horizontal incision, placing it with reference to the facial nerve and external carotid artery.

All these dissections are carried down through skin and superficial fascia only, these parts being then stripped forward, exposing the gland which is punctured bluntly in as many places as may be necessary, avoiding the duct and facial nerve. All these writers prefer this extensive opening, not only for its safety and efficiency, but they state that the cosmetic result is better than where the stab-wound type of opening is used. Direct incision into the gland may result in salivary fistula.

*Etiology and History.*—Views as to the etiology of postoperative parotitis, have changed markedly as the advancement of surgery has nullified the former hypotheses.

Wagner says that Munde in 1878, described the first case of parotitis after ovariotomy, and soon thereafter Moeriche, Goodell and others reported further cases after similar operations. Paget, in 1886, collected 101 cases of this complication and, as abdominal surgery then chiefly dealt with the pelvic organs, particularly with ovariotomy, advanced the hypothesis that the peritoneum, genital organs and parotids were indirectly and reflexly related. Taylor, in the same year, suggested sepsis as the cause and there was repeated controversy over this point until Hanau in 1889, declared that parotitis occurred secondary to infection of Stenson's duct by mouth organisms.

The theory of reflex relation to the pelvic organs was soon discarded as the surgical field broadened, and it was found that parotitis occurred just as frequently after operation elsewhere on the body. However, the two theories that metastatic foci develop in the parotid only from sepsis, on the one hand, and that it is a local extension of infection from the mouth up Stenson's duct, on the other, have continued until today, with, at present, the more general consensus of opinion favoring the latter view.

Rolleston and Oliver in 1919, discussed the occurrence of secondary parotitis in the medical treatment of 1000 cases of gastric ulcer. In 530 cases, where some food was allowed by mouth, the incidence of this complication was 0.4 per cent, while in 470 cases treated by oral starvation with rectal feeding only, 4 per cent or ten times as many patients developed parotid infection when the salivary glands were inactive. Collins, in the same year, reached similar conclusions in

reporting a series of parotitis cases occurring in patients on the Ochsner treatment.

Hanau and Pilliet in their monographs, said that organisms go up the duct and, in their pathologic specimens, demonstrated that the inflammation began around the ducts and spread outward into the perilobular tissues; whereas, they argued, should the etiology be embolic, the inflammation should at first appear as a perivascular process.

Tait and Girode have both shown that the outer third of Stenson's duct normally contains the same organisms as are found in the mouth. On the other hand, Dyball states that if buccal dryness is a factor in promoting parotitis, the sublingual and submaxillary glands should be affected with similar regularity. These glands are occasionally involved, but rarely so, cases having been reported by Jennings and others. The rarity of this condition is explained by Lynn, who observes that the parotid is essentially a serous gland while the sublingual and submaxillary glands are of the mucous variety; he adds that Stuart-Low has demonstrated a definite inhibitory influence of mucin on bacterial growth. Likewise the parotid contains lymph nodes, while the other glands do not, thus favoring the extension of inflammatory processes in the former.

Manton and others have reported parotid involvement in pernicious vomiting of pregnancy but state that its occurrence is extremely rare.

Certain contributing factors which influence early extension of infection up the duct have been mentioned. Among these are the inhibition of salivary flow by pyrexia, and by such drugs as atropine, as well as the possibility of anesthetic injury by too vigorous compression at the angles of the jaw. Likewise general debility and chronic wasting diseases seem to be factors which increase the incidence of parotitis following operation.

In spite of the above observations, many surgeons are of the opinion that secondary pyogenic parotitis originates as a result of metastatic foci from purulent exudates elsewhere in the body, or is a part of a general pyemia. Buscarlet and Kaiser abroad, and Jennings and Fisher, in this country, hold this view. Certain cases reported would seem to corroborate this theory but as a rule the evidence of positive blood culture is lacking. Blair, from his own cases and a careful study of the literature, concludes that in a great majority of instances postoperative parotitis is not blood borne.

*Prevention.*—Even though the etiology of this condition has not definitely been proved, still, with the weight of evidence so strongly favoring the mouth as the source of infection, any preventive measures must necessarily be directed at this point.

The systematic examination of the teeth and buccal mucous membranes, with as much care as one would consider the heart, lungs or

blood pressure before operation, and the adoption of means to minimize oral sepsis, particularly in those debilitated individuals with chronic wasting diseases, would serve to eliminate many cases of this complication.

It is quite true that in emergency operations there is no time for such measures, but even here the immediate postoperative care of the mouth must be emphasized if parotitis is to be avoided. The contributing factor of buccal dryness, with the increased number of mouth bacteria can be prevented with early administration of fluids, mouth wash and mastication exercises, for which chewing gum and hard candy have been highly recommended. The last is of particular value in those cases where the type of operative procedure necessarily prohibits fluids by mouth in the first forty-eight hours. Likewise, these measures, with gentle massage of the gland, will, at times, serve to abort an early parotitis by reestablishing drainage through the duct.

In conclusion, it is earnestly suggested that the value of such preventive measures be noted and where cases do occur, that a bacteriologic study of the blood, gland and mouth be made. Such data will greatly aid in establishing the true etiology of this condition.

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114 East Fifty-fourth Street. (*For discussion see page* 118.)

# OBSTETRIC MORTALITY*

## An Analysis of the Cases at the Lying-In Hospital in 1924

By Meyer Rosensohn, M.D., New York, N. Y.

*(Attending Surgeon, Lying-In Hospital)*

IT is with considerable trepidation that this paper is presented, for the figures are high and the report not very encouraging, but at the same time, presenting facts which warrant discussion. It is based on the service of the New York Lying-In Hospital for the year 1924.

As a preliminary, it is necessary to emphasize certain fundamental facts, well known as they undoubtedly are, for a proper interpretation of the figures and remarks:

1. The City Health Department requires a stillbirth certificate for every case where an embryo or fetus is expelled, whether the period of gestation be three months or ten months.

2. A stillbirth differs from a death of baby in the absence of respiratory movement; thus, a fetus, born with the heart beating even for an hour or more, if no respiratory effort be made, is considered a stillbirth.

3. A premature baby has been arbitrarily considered where the time factor was not available, as a fetus weighing 1600 grams or less. The term premature and its application is being considered by a committee from several of the maternity hospitals and the criteria for the classification are not yet determined.

4. Finally, in analyzing the figures it must be remembered that a hospital with public wards has a greater proportion of abnormalities and operations, hence, a greater incidence of morbidity and mortality.

During the year, there were in an indoor and outdoor service, a total of 5,457 confinements, among which there were 227 stillbirths and 152 infant deaths. During this period there were 23 adult deaths.

Considering the maternal deaths first, and eliminating one, a surgical case in a patient who was not pregnant, there were 22 obstetric deaths, a mortality of 0.4 per cent, or 4 per thousand. Among these cases there were:

1. Two patients with syphilis dying antepartum, after the administration of salvarsan. The symptoms indicated an encephalitis.

2. One case of antepartum sepsis where the patient had been ill for two weeks, had a high temperature on admission, and died within a half hour of the spontaneous delivery of a stillborn fetus.

3. One patient with postpartum sepsis, admitted three days after delivery by an outside physician, and dying five days later.

4. Two cases of endocarditis with decompensation, one patient in the fifth month, and the other in the seventh month of pregnancy. In both of these a vaginal hysterotomy was done for the cardiac conditions; both died within a few hours after the operation.

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*Read, by invitation, at a meeting of the New York Obstetrical Society, May 12, 1925.

While these six deaths occurred in the hospital, in the effort to arrive at a figure directly applicable to our institutional care it might be feasible for the time to subtract them from the 22 maternal deaths, thus leaving 16 in 5,457, a percentage of 0.3 or 1 in every 341 cases. In this connection the figures of the New York Health Department for the entire city, for 1923, indicate a death rate of 623 in 135,183 births,—a percentage of 0.46, or 46 per thousand, or 1 in 217 cases; and for 1924, a death rate of 678 in 136,884 births,—a percentage of 0.5, or 50 per thousand, or 1 in 202 cases.

It may be well for a moment to refer to the deaths due to salvarsan. The two patients were in the last month of gestation and had been treated for syphilis for some time because of a positive Wassermann. Both were given neosalvarsan intravenously with the usual precautions, only 0.45 grams being administered. Both developed toxic symptoms, became drowsy, and died within a week. No autopsies were permitted. Whether these cases occurring within a short time warrant the assumption of increased danger of salvarsan administration in the antepartum period, or were due to some coincidence either in the patients or the drug is a matter for discussion. Such an experience, however, in the hands of an expert with all the safeguards has made the staff at the Lying-In Hospital timorous about forcing this treatment at such a period.

In the sixteen cases of our remaining adult deaths, there were nine cesarean sections, three internal podalic versions, and four spontaneous deliveries.

Cesarean section was done 190 times during the year, an incidence of 3.48 per cent, or 1 in 28.7 cases, with a mortality of 4.7 per cent. Death was due to the following causes: general peritonitis in three, embolism in two, postpartum hemorrhage in one, postpartum sepsis in one, lobar pneumonia in one, and shock and relaxation of the uterus in one.

Internal podalic version was done 149 times during the year, an incidence of 2.73 per cent, or 1 in 36 cases with a mortality of 3 per cent. Death was due to postpartum hemorrhages from placenta previa in one, from premature separation of the placenta in another, and from ruptured uterus and general peritonitis in a third case.

It is, of course, to be remembered that while this represents a fatality where the operation of internal podalic version was done, death was due to the placenta previa and premature separation of the placenta, so that our real death rate is only one, the last, where the operation was done for a generally contracted pelvis.

In the remaining cases, in which the deliveries were spontaneous, there were three cases of eclampsia and one of embolism.

There were 13 cases of eclampsia during the year, an incidence of 1 in 419, and a mortality of 23 per cent.

Now, considering the fetal and infant death rates, there were in the total confinements of 5,457, with 5,508 babies:

| | |
|---|---|
| Stillbirths | 227 or 4.1 per cent or 41 per 1000 |
| Infant deaths | 152 or 2.8 per cent or 28 per 1000 |

In all of these 379 deaths and stillbirths there were 159 autopsies.

With the definitions already outlined, these stillbirths are classified under the headings of full term, premature, and macerated, in Table I.

TABLE I

| | NO. OF CASES | PER CENT OF TOTAL CONFINEMENTS (5,457) |
|---|---|---|
| Macerated | 94 | 1.7 |
| Premature | 48 | 0.9 |
| Full term, operative | 59 | 1.0 |
| Full term, spontaneous | 26 | 0.5 |

Thus, it is seen that in 94 cases or 41 per cent of the stillbirths the fetus was already macerated at the time of delivery. Among these, there were:

| | |
|---|---|
| Positive Wassermann in mother | 15 |
| Negative Wassermann in mother | 60 |
| No Wassermann taken | 19 |

In more than half of the macerated fetuses (64 per cent), there was neither clinical nor laboratory evidence of lues in the mother, nor was there any evidence in the stillborn fetus at the postmortem examination. Excluding the 15 positive cases, in the 79 remaining macerated fetuses definite causes were found in 35 cases as follows: toxemia and eclampsia, 13; previous stillbirths, 5; diabetes, 4; fall or blow, 2; tight cord, 3; placenta previa, 2; hydrocephalus monster, 2; pyelitis, 1; premature separation of placenta, 1; fibroid uterus, 1; and general peritonitis in mother, 1.

In the remaining 44 cases, including the 19 in which no Wassermann was made, the causes were not ascertainable.

As stated above, the premature infants among the stillbirths numbered 48 and included all embryos or fetuses under 1,600 grams. Many of these were cases properly called abortions of three to five months, but 5 were anencephalics, and will be referred to later.

In considering the deaths of babies, all cases were included where the child breathed and where death occurred either immediately or at any time in the hospital stay of ten days. For purposes of classification these were subdivided into premature or full term, as here shown:

| | | |
|---|---|---|
| Premature | 73 or 1.3 per cent of total confinements | |
| Operative delivery | | 19 |
| Spontaneous delivery | | 54 |
| Full term | 79 or 1.4 per cent of total confinements | |
| Operative delivery | | 28 |
| Spontaneous delivery | | 51 |

A consideration of the full-term baby and the method of delivery is of interest:

| | Stillbirth | Deaths |
|---|---|---|
| Operative delivery | 59 | 28 |
| Spontaneous delivery | 26 | 51 |

In other words, a total of 164 full-term deaths and stillbirths occurred in 5,457 confinements.

An interesting study of the important causes in these full-term cases is given in Table II.

TABLE II

| | OPERATIVE | SPONTANEOUS |
|---|---|---|
| Atelectasis and asphyxia | 28 | 18 |
| Cerebral hemorrhage | 28 | 15 |
| Fracture or separation of vertebrae | 8 | 3 |
| Craniotomy | 6 | |
| Anomalies | 4 | 11 |
| Inanition | | 5 |
| Bronchopneumonia | | 3 |
| Hemorrhagic disease | | 4 |
| Other causes | 13 | 18 |
| Total | 87 | 77 |

The incidence of cerebral hemorrhage in almost one-third of the operative and one-fifth of the spontaneous deliveries is noteworthy. Next to this is the occurrence of anomalies, including congenital malformations, almost all incompatible with life; four of which were in the operative and eleven in the spontaneous deliveries.

Table III deals with the congenital anomalies most of which came to autopsy.

TABLE III

| | DEATH | | STILLBIRTH | | | TOTAL |
|---|---|---|---|---|---|---|
| | FULL TERM | PREMATURE | MACERATED | FULL TERM | PREMATURE | |
| Anencephaly | | | 1 | 3 | 5 | 9 |
| Monstrosity | 1 | | | | | 1 |
| Congenital heart | 2 | | | | | 2 |
| Umbilical hernia | 3 | | | | | 3 |
| Hydrocephalus | | | 1 | | | 1 |
| Hydrocephalus and spina bifida | 1 | 1 | | | 1 | 3 |
| Eventration | 1 | | | | | 1 |
| Stricture of esophagus | 1 | | | | | 1 |
| Absence of intestine | 2 | | | | | 2 |
| Diaphragmatic hernia | 1 | | | | | 1 |
| | 12 | 1 | 2 | 3 | 6 | 24 |

The study of the mortality records for the year has afforded the opportunity to obtain the rates for the more common obstetric procedures and conditions and so has developed some significant figures. These are noted in Table IV, which excludes the macerated fetuses from consideration.

With regard to the six craniotomies, in three cases perforations were performed where internal podalic version had been done. One

was a full-term and two were macerated fetuses. The other three were craniotomies on full-term fetuses; one of these was already dead at the time of delivery, congenital lues being present.

TABLE IV

| | ADULT DEATH | TOTAL NO. CASES | % MATER. DEATH | BABY | | | | | INCIDENCE 1 IN | % FETAL MORTALITY |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FULL TERM | | PREMATURE | | TOTAL | | |
| | | | | DEATH | STILLBIRTH | DEATH | STILLBIRTH | | | |
| Placenta previa | 1 | 23 | 4.3 | 1 | 4 | 6 | 2 | 13 | 237 | 56 |
| Premature separation of placenta | 1 | 11 | 9.0 | 1 | | 1 | 1 | 3 | 495 | 27 |
| Prolapsed cord | | 29 | | 1 | 3 | | | 4 | 188 | 14 |
| Cesarean section | 9 | 190 | 4.7 | 1 | 5 | 4 | 3 | 13 | 29 | 6.8 |
| High forceps | | 27 | | | 5 | | | 5 | 202 | 22 |
| Craniotomy | | 6 | | | 6 | | | 6 | 909 | |

The striking figures in Table IV are the 4.7 per cent maternal and 6.8 per cent stillbirth and infant deaths in the cesarean cases, the high baby rate for high forceps, and the comparatively low rate for prolapsed cord. Hofmeier[1] reports regarding placenta previa, an incidence of 1 in each of 79 obstetric cases, with a death rate of 7.5 per cent. Kellogg,[2] reporting on the mortality of placenta previa for the last twenty-five years at the Boston Lying-In Hospital, refers to a total of 218 cases with 38 maternal deaths or 13.5 per cent. To be fair, however, the figures range from 17 per cent (1895-1900), and 24 per cent (1905-1910), and 6 per cent (1915-1920), with a fetal mortality in 1910-1915 of 44 per cent and for 1915-1920 of 48 per cent. Lynch,[3] reporting on placenta previa at the Boston City Hospital, states an incidence of about 1 in 100 cases, with a maternal mortality of 19 in 91 cases, or 20 per cent, and a fetal and baby mortality of 51, or 55 per cent; excluding macerated fetuses and nonviables, he has a corrected fetal mortality of 25 per cent.

The breech deliveries are indicated in Table V.

TABLE V

| | DEATHS | STILLBIRTHS | TOTAL |
|---|---|---|---|
| Premature | 4 | 5 | 9 |
| Full term | 9 | 8 | 17 |
| Macerated | | 10 | 10 |
| | 13 | 23 | 36 |

The total number of breech cases was 140, which results in an incidence of 1 in 39 cases and a mortality of 26 per cent. Although this is the gross mortality in the breech cases, if the ten macerated fetuses are excluded it becomes 18 per cent.

An analysis of the causes of death in the 17 full-term breech cases referred to above gives the following: Anencephaly, 2; hydrocephalus and spina bifida, 1; separation or fracture vertebrae, 3; as-

phyxia, 5; cerebral hemorrhage, 5; and hemorrhagic disease, 1. If the three congenital anomalies are eliminated from the 26 breeches there is a mortality of 23, or 16.4 per cent for the breech cases.

The figures quoted and the tables outlined indicate a maternal mortality per 1000 of 4, a stillbirth rate of 41 and a baby death rate of 28. How these compare with figures published elsewhere is shown in the statistics quoted by Dr. Dublin,[4] of the Metropolitan Life Insurance Co., who says, in an address before the American Child Hygiene Association,[4] "There are born alive each year in the United States approximately 2,620,000 babies. Of this number about 7.6 per cent, or 199,200, die before they are a year old. Early infant mortality accounts for about 109,000 of these deaths. These deaths are, for the most part, due to the following conditions: malformations, prematurity, congenital debility, syphilis, and injuries at birth. To this number must be added an almost equal number of fetal deaths at or near full term, which properly belong to this group. These are the stillbirths, which number about 100,000."

In a discussion of Dr. W. J. Bell's paper on maternal mortality read before the same association, Dublin further refers to a maternal death rate of close to 8 per 1,000 in the United States, and in New York City, a little under 5 per 1,000. In other words, in 2,620,000 births there were about 109,000 early infant deaths (under one month) and 100,000 stillbirths; a percentage for the latter of 3.8, and for the former 4.1, a total of 7.9.

Bell, at the same meeting, reported a maternal mortality, in Ontario, of 4.52 per 1,000, in 1919, and 6.75 per 1,000, in 1925. The rates for England and Wales were 4.12 per 1,000, in 1919.

In the city of New York, the last figures obtainable, for 1923 and 1924, are as follows:

| | 1923 | 1924 |
|---|---|---|
| Total birth rate | 135,183 | 136,884 |
| Stillbirths | 6,023—4.4 % | 6,448—4.7% |
| Total deaths under 1 month | 4,132—3.1 % | 4,346—3.2% |
| Maternal deaths | 625—0.46% | 678—0.5% |

Kickham,[5] in a series of 1,000 consecutive obstetric cases at St. Elizabeth's Hospital, reports a maternal mortality of 5 or 0.5 per cent, and 55 infant deaths or stillbirths. Haven Emerson,[6] in a study of "Maternal and Infant Mortality in Physicians' Families," reports that in 1,974 pregnancies, there were 1,910 living children and 9 maternal deaths.

As showing the influence of prenatal care, a report on "Prenatal Work in Detroit"[7] indicates a mortality of 3.1 per 1,000 in 1,599 cases under the care of the prenatal clinic; for the entire city, in 1922, in 27,277 confinements, there was a maternal mortality of 6.8 per cent per 1,000, and a stillbirth rate of 53.

A bulletin from the Department of Commerce, at Washington,

shows for the Birth Registration Area of 1915 (constituted by 10 states and the District of Columbia) a maternal mortality of 6.4 per 1,000, in 1923. Of 30 states with available figures the rate varies from 5 (in Utah) to 9.7 (in South Carolina).

The one hundred and second annual report of the New York Nursery and Child's Hospital for 1924 gives some parallel statistics which are of interest. In their service, including 1,833 indoor deliveries with 1,852 births, and 444 outdoor deliveries with 447 births, there were:

| | | |
|---|---|---|
| Maternal death rate of | 9, or 0.4 per cent, | i.e., 1 in 252. |
| Stillbirth rate of | 107, or 4.4 per cent, | i.e., 1 in 22.4 |
| Baby death rate of | 30, or 1.3 per cent, | i.e., 1 in 76. |

A total of 24 macerated fetuses occurred, representing about one-fourth of the stillbirths. Breech presentation was encountered 88 times; placenta previa, with 1 maternal death and 4 stillbirths, 11 times; high forceps, 25 times; and craniotomy, 4 times. Among the stillbirths anencephaly occurred 5 times and other defects of development 6 times. Among the deaths of babies congenital anomalies occurred 4 times and premature separation of the placenta, with 7 stillbirths, occurred 12 times.

A study of the figures quoted from the New York Lying-In Hospital and a comparison with those from other places, leaves one with a discouraging sense of the inevitability of certain figures. High as is the stillbirth and baby death rate, and the loss of mothers, one must be struck by the fact that a certain cost must be paid. It is true that, considering the infants, there should not have been 3 craniotomies on living babies, or 10 fractures or separated vertebrae, or 43 cerebral hemorrhages, yet there can never be eliminated the 24 congenital anomalies, the premature babies, miscarriages or abortions, or in great measure, the occurrence of macerated fetuses.

What should be done, however, is to concentrate more on the full-term fetuses, by watching for abnormalities; not to permit a woman who has gone through more or less distress for ten months to have a stillborn baby because interference was not instituted until too late. The fetus should be observed closely for signs of distress as evidenced by a passage of meconium, turbulent movements, or by rising, slowing, or irregularities of the heart. The obstetrician should interfere, and not alone where there is fetal distress but even before this state is reached.

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20 WEST FIFTIETH STREET.

# CONGENITAL HERNIA AT THE LINEA ALBA*

By H. R. Charlton, M.D., Bronxville, N. Y.

*(Attending Obstetrician, Lawrence Hospital, Bronxville, N. Y.; Adjunct Assistant Surgeon, Woman's Hospital, New York City)*

CONGENITAL hernia at the linea alba occurs approximately once in each five thousand births and at various periods its accumulated literature has been reviewed. A study by Linfors, of Lund, covered the subject from the time of Paré to 1891; the Zurich dissertation of Guido Alder, of Samaden, carried it to 1903; the Rittershous "Arbeit" was published at Leipzig, in 1907, while somewhat later the Bordeaux thesis of Pain terminated its monographic consideration, the combined effort of these investigators resulting in a résumé of sixty cases. Recently my study of all reports available in the files of the New York Academy of Medicine and the Surgeon-General's Office indicates that up until 1925, two hundred and fifty cases have been described in the international literature, and it has been possible, through personal communication, to accumulate several others. Lack of space and the doubtful value of so many individual case reports make it desirable to withhold these voluminous details.

Oken and Meckel, in 1810 and 1812, first recognized this defect to be due to the persistence of a condition normal during early intrauterine life, easily appreciated in a six mm. embryo where inspection shows no effort at umbilical cord formation; but a ventral mound enclosing a cavity outside of, yet continuous with the abdomen, containing primitive ileum and jejunum in U-loop formation. If at the tenth week some defect in the embryonal developmental scheme occurs and the U-loop or other partially or completely contained viscera are not withdrawn, there occurs the cardinal step in the production of this condition; the extraabdominal anatomy soon reaching a size precluding its future abdominal placement, further growth taking place outside of the usual body cavity.

This condition is not a hernia of the umbilical cord, for in the presence of this defect no cord precedes its formation, no cord existing until the confines of the tumor have been passed. It lies, a mass upon the abdominal wall of the newborn, covered by glistening amnion which meets the abdominal skin in a sharp contact of immediate and complete demarcation. Within this enclosure lie vascular elements and a golden-yellow layer of compact Wharton's jelly,

*Abstracted from a paper read by invitation, before the New York Obstetrical Society, May 12, 1925.

loosely applied about a peritoneal sac, most frail and delicate, within which, usually adherent, may lie any viscera of the chest, abdomen, or pelvis.

### PERSONAL CASE REPORT

The investigation resulting in this paper was inaugurated by my experience with Case No. 8701, Lawrence Hospital, January 22, 1924. In the eighth month of her pregnancy I was consulted by a disciple of Christian Science who had been delivered of a normal boy before embracing this faith. She was water-logged, toxic to an alarming degree, and I accepted her care with trepidation. Admitted to the hospital, she had a precipitate labor, delivering herself of a six pound boy on a stretcher while being hurried to the delivery room. Her long, thin, tumultuous infant presented at the umbilicus a grapefruit-shaped tumor 10 cm. in diameter, containing intestinal coils, gall bladder and part of liver with the general appearance noted above. Three hours after birth a plastic operation was accomplished almost without anesthesia and in spite of extensive visceral manipulation following straining, which almost emptied the abdomen of its content, the patient left the operating room in splendid condition. For forty-eight hours there was neither distention nor vomiting. Bowels moved naturally, water was taken every three hours, lips and tongue were pink, soft, and moist; there was no temperature elevation, and the baby was apparently comfortable. At fifty hours, it suddenly became cyanotic and died.

On several occasions it has been shown that congenital hernia at the linea alba is an expression of physical inferiority very likely to be associated with cardiac and other defects.

### TECHNIC

When an anesthetic is to be given, chloroform is first choice, but much difficulty may result even from its administration. The abdomen and mass is coated with 5 per cent picric acid in 95 per cent alcohol, having an assistant hold the infant's legs. In the absence of anesthesia it is surprising to find scant evidence of pain during an encircling skin incision made close to the amnion. Working from this incision towards the mass, the skin is freed from the underlying tissue until the skin amnion contact is reached and its underlying structure found wire-like in resistance, purse-string in placement. This is to be cut across, resulting in immediate release of tension (but not until infant's sensory apparatus has been clouded, this being a sensitive area). The amniotic hood with its attached narrow selvage of skin is peeled off, exposing the underlying jelly coat. This gives way before pressure of the gloved finger, leaving an irregular oval area of variable size where only peritoneum covers underlying coils of bowel and protruding viscera. If, without opening the peritoneum, the hernia can be reduced and the rectus fascia—a structure of real strength at birth—can be grasped, sutured, and approximated, operative result is likely to be satisfactory. At this stage straining may necessitate continued use of chloroform, particularly if the peritoneum is to be opened, an essential step in the presence of adhesions. The abdomen is so small that straining may

result in eventration, great difficulty being encountered in replacement. Adhesions may be so dense (this applies particularly to liver protrusions) that sacrifice of part of this organ, even a considerable part, may be imperative. Every reasonable effort must be made to reduce and cover the mass, despising nothing available for retaining or protecting planes, utilizing, if necessary, homologous grafts, thus acknowledging the unestimated and immeasurable power of young tissue for survival.

I have had an opportunity to operate extensively on two very small infants, one premature weighing three pounds, another premature weighing six, and I have been impressed with the utter indifference of these immature forms to physical insult. After-treatment has presented no problem, these patients being easily handled when the wound area is adequately protected and supported. They are so obviously comfortable whether bottle or breast fed, one must conclude pain perception to be of the lowest grade, apperception all but absent, while reconstructive tissue changes occur with amazing speed. The mortality is approximately 30 per cent.

(*For discussion see page* 120.)

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## THE RELATION OF BLOOD SEDIMENTATION TO PELVIC DISORDERS

By Thomas H. Cherry, M.D., F.A.C.S., New York City, N. Y.

WHEN blood is drawn from the vein of a patient and to it is added an anticoagulent, the red blood cells settle by gravity to the bottom of the testing tube. The rate of settling, or sedimentation, has been noted to differ in health and in disease. Numerous contributions to literature, largely European, concerning this test have been made during the last twenty years. Many experiments have been made and theories have been expounded in attempts at explaining why the rate of settling should vary under different physical conditions. A study of the vast literature and what has been definitely demonstrated by physiologists, would seemingly show:

1. That the red blood cells, being heavier than the plasma, gravitate.
2. Any condition disturbing the balance between these two elements would unquestionably interfere with the rate of speed at which settling took place.

If the plasma becomes more concentrated by an increase in its solid elements the red cells gravitate more slowly. If the hemoglobin of the red cells is diminished, rendering them lighter in weight, a slower sedimentation takes place. This is well demonstrated in secondary anemia. An increased rate of settling transpires if the plasma becomes more liquid or if the hemoglobin of the red cells is relatively increased.

In pernicious anemia, the sedimentation time is much faster than normal, which seems to bear out this theory.

In order to understand this change in the fluid and formed elements of the blood stream, one is led into the realms of experimental biochemistry to ascertain whether the settling of the erythrocytes may be influenced by changes in the viscosity of the plasma, a disturbance in the electric conductivity between the plasma and erythrocytes, or the increase in the agglutination of the red cells, promoting their rapid rouleaux, or clumping formation. Let it be sufficient to say that there are many biochemical changes continually taking place in the human mechanism, both in health and disease, that influence the rate and time of erythrocytic sedimentation.

One can readily understand that a wide variation in opinions might easily occur, when it is considered that the component elements of the blood entering actively in this test are subject to great flexibility and rapidly changing biochemical conditions. The blood is never still during life, neither is it constant in composition, as it is influenced by exercise, rest, food, drink, sleep, and diseased states,—all of which may be factors in causing these conflicting opinions. It would seem that a sedimentation of one hundred and fifty minutes or over could be classed as normal in healthy individuals.

Fahreus, and later Linzenmeier, observed during the pregnant state an increased speed of sedimentation and attempted to utilize it as a diagnostic agent. At times it becomes necessary to differentiate normal pregnancy from uterine myomata, tubal gestation, ovarian tumors, and incomplete abortion. The sedimentation time among these groups has been so similar and inconstant among the few cases I have done, that it was of no diagnostic aid (Table I).

TABLE I

RELATIVE VALUE OF SEDIMENTATION TIME IN CASES OF PREGNANCY, FIBROMYOMA, ECTOPIC PREGNANCY AND INCOMPLETE ABORTION

| | SEDIMENTATION TEST, MINUTES |
|---|---|
| Pregnancy | 35– 70 |
| Incomplete Abortion | 38– 70 |
| Fibromyoma | 25– 70 |
| Tubal Pregnancy | 35–100 |

While visiting various European clinics several years ago, I was much impressed by the dependence placed upon the sedimentation test in pelvic infections as a diagnostic and prognostic aid. Following the teachings of Linzenmeier, they considered as an active infection a sedimentation time of thirty minutes or less, and a latent infection one of sixty minutes or less; therefore, any operative procedure deemed necessary is postponed until the test is well over sixty minutes. Friedlander does not operate upon pelvic infections until the

sedimentation time is two hours (one hundred and twenty minutes), and considers it of more value in determining the time of the procedure than the leucocyte count, temperature, or clinical findings.

At the Harlem Hospital, New York, where 40 per cent of the gynecologic patients have some form of adnexal disease, it has been our policy to place considerable dependence upon the leucocyte count and temperature as an indication of the degree of infection. We group these patients according to whether the count is under 16,000 as signifying a mild infection, or an active infection when the count is above 16,000. We do not hesitate to operate upon the first group, if their temperature becomes normal and remains so for three to five days, provided the clinical findings are such as to justify it.

Among the second group, we prefer to await the subsidence of the temperature and a definite lowering of the leucocyte count to 16,000 or less, before surgical intervention is undertaken; however, in certain progressive inflammatory conditions such an interval is not observed, and operation is performed with leucocytes still high.

In a series of 628 patients who had abdominal sections performed for adnexal disease, 508 had leucocyte counts of 16,000 or less. Among this group there was a mortality of 4.1 per cent and an average morbidity of 17.8 days. There were 120 patients whose leucocyte counts were above 16,000. This group had a mortality of 16.6 per cent and an average morbidity of 18.5 days.

These results definitely show that the leucocyte count is a dependable agent in determining, to a certain extent, the degree of infection.

In order to ascertain whether the sedimentation test was more dependable than the leucocyte count in pelvic infections and the relative value of each as a prognostic indicator, 71 patients were closely observed both pre- and postoperatively. Twenty-six of these patients were operated upon with removal of their pelvic lesions, consisting of tubal and tuboovarian abscesses. The sedimentation time in all was under thirty minutes. The leucocyte counts averaged 13,250. No deaths occurred and the average morbidity was 18.2 days.

TABLE II

GROUPING SEDIMENTATION TEST IN OPERATIVE CASES OF ADNEXAL DISEASE

| GROUPS SEDIMENTATION TEST | NUMBER CASES | AVERAGE LEUCOCYTE COUNT | AVERAGE MORBIDITY IN DAYS | DIED |
|---|---|---|---|---|
| 10-20 minutes | 16 | 13,345 | 19 | 0 |
| 20-30 minutes | 10 | 13,210 | 18.6 | 0 |
| Total | 26 | 13,277 | 18.8 | 0 |

Another group of 29 patients was operated upon with pathology similar to the preceding group. Their sedimentation time was between thirty and sixty minutes, with a leucocyte count averaging 10,200. No deaths occurred. The average morbidity was sixteen days.

TABLE III

GROUPING SEDIMENTATION TEST IN 29 OPERATIVE CASES OF ADNEXAL DISEASE

| GROUPS SEDIMENTATION TEST | NUMBER | AVERAGE LEUCOCYTE COUNT | AVERAGE MORBIDITY IN DAYS | DIED |
|---|---|---|---|---|
| 30-40 minutes | 14 | 10,260 | 18 | 0 |
| 40-50 minutes | 9 | 10,150 | 15 | 0 |
| 50-60 minutes | 6 | 10,200 | 15 | 0 |
| Total | 29 | 10,205 | 16 | 0 |

In these two groups, totaling 55 patients, the sedimentation time in 26 patients indicated active infection, and in 29, active and latent infection; therefore, according to Linzenmeier, they should not have been treated surgically. The leucocyte count was only slightly above normal in the entire 55 cases, which seems, in view of the results, to have been of more value in estimating the degree and virulence of the infection.

Sixteen patients with the same pelvic pathologic lesions were also operated. Their sedimentation time averaged from sixty to one hundred and ten minutes. The leucocyte count averaged 10,400. One patient whose sedimentation test was sixty-eight minutes and who had a subacute appendicitis accompanying the pelvic infection, died on the ninth day from a general peritoneal infection. The average morbidity was eighteen days.

TABLE IV

GROUPING SEDIMENTATION TEST IN OPERATIVE CASES OF ADNEXAL DISEASE

| GROUPS SEDIMENTATION TEST | NUMBER | AVERAGE LEUCOCYTE COUNT | AVERAGE MORBIDITY DAYS | DIED |
|---|---|---|---|---|
| 60-70 minutes | 8 | 10,000 | 20 | 1 |
| 70-80 minutes | 2 | 13,300 | 16 | 0 |
| 80-90 minutes | 3 | 11,600 | 16 | 0 |
| 90-100 minutes | 1 | 9,000 | 14 | 0 |
| 100-110 minutes | 2 | 10,500 | 24 | 0 |
| Total | 16 | 10,880 | 18 | 1 |

It would appear from the foregoing data that in the series of 71 operative cases having adnexal disease, the sedimentation time was extremely fast (55 being under sixty minutes) to have registered such a mild degree of infection as results of the operative procedure demonstrate. On the other hand the leucocyte count indicated mild or subsiding infections, as the gross pathology and operative results prove. It would seem that the leucocyte count in this series was of more value in estimating the degree of infection than the sedimentation time.

In the entire 71 patients, following the removal of the pelvic pathology, the sedimentation time increased from five minutes in the slower counts to thirty minutes in the faster ones. As there was no evidence of infective foci in other parts of the body, we can assume that the pelvic inflammatory processes produced the change in the blood stream sufficient to give the reactions of sedimentation above recorded.

It might not be amiss to give a résumé of the following case report in order to illustrate the comparative value of the leucocyte count and sedimentation test as a diagnostic agent.

Mrs. S. upon whom two previous laparotomies had been performed, had acquired an incisional hernia of moderate size. She had also a uterine fibroid tumor (4 by 6 cm.) and a cystic right ovary, both of which apparently were producing typical symptoms. At operation, upon dissecting free the adherent loops of gut from the sac, the intestine was accidently perforated in two places. An enterorrhaphy was done and the pelvic lesion removed. An overlapping repair for the hernia was executed. The abdomen was closed without drainage. A rubber tissue drain, however, was inserted subcutaneously through the lower angle of the incision. This patient was watched with considerable anxiety, for while there was no soiling of the peritoneal cavity by intestinal contents, experience has shown that accidental wounds of the small gut are attended with a high mortality. The patient reacted well for forty-eight hours when there was a rise of temperature to 103° F. accompanied by increase in vomiting, abdominal pain and distention, with considerable physical depression. For the next twenty-four hours this condition continued and a general peritonitis was believed to be present. At this time the sedimentation test showed a fifteen-minute reaction; the leucocyte count was 12,200 with 67 per cent polynuclears. Gastric lavage and enemas were administered, the temperature dropped to normal, and there was reduction of all abdominal symptoms; an uneventful recovery without wound infection ensued.

This case is related as an illustration of how the sedimentation test can cause unnecessary alarm and that the leucocyte count was the dependable factor in differentiating a dynamic ileus from a general peritonitis.

Another group of 39 patients having adnexal disease was not operated upon. Only conservative therapeutic measures were administered—rest in bed, hot vaginal douches and diathermy. The sedimentation time ranged from twenty to ninety minutes. The leucocyte count in 35 patients was below 16,000; in 4 it was above 16,000. One patient had a leucocyte count of 54,000 (3 counts made by different men), a sedimentation time of thirty minutes, and a temperature of 104° F. She had two large, adherent, tender pelvic masses that were reduced by diathermy in three weeks time, with a gradual reduction of the leucocyte count and a rise in the sedimentation time.

TABLE V

GROUPING SEDIMENTATION TEST AND LEUCOCYTE COUNT IN 39 NONOPERATIVE CASES OF ADNEXAL DISEASE

| | | |
|---|---|---|
| Leucocyte Count | Up to 16,000 | 35 Cases |
| | Above 16,000 | 4 Cases |
| Sedimentation Test | As a Group | 20-90 Minutes |

SEDIMENTATION TEST IN OTHER GYNECOLOGIC CONDITIONS

In order to observe the sedimentation time in patients with pelvic conditions, 14 patients with fibromyoma were tested. In 9 patients

the end reaction was less than thirty minutes, and in 2 it was below sixty minutes. The leucocyte count of these patients were all under 13,000. Most of these patients at operation presented, besides their fibroid tumor, an adnexal inflammation of some kind, but not of such an active form, however, as to account for the rapid time of settling. One exception was in a patient who had eighteen minutes sedimentation time, probably due to a mild pyelitis. One patient in this group died on the fourteenth day from pulmonary embolus. Four other patients had tests above sixty minutes.

There were 4 tubal pregnancies that gave a sedimentation time from thirty-five to one hundred minutes.

Incomplete abortions varied from thirty-eight to seventy minutes. Early pregnancies averaged fifty to sixty minutes in their sedimentation time; late pregnancies from thirty-five to forty-five minutes.

In 2 patients who had advanced cancer of the cervix and extensive metastases, the sedimentation time was fifteen and sixteen minutes. Both had leucocyte counts above 16,000. They died on the fourteenth and thirty-fifth day following their admission, having had palliative treatment only. Three other early cervical cancers showed a sedimentation time of thirty, thirty-five and fifty minutes, respectively.

One cyst adenocarcinoma of the ovary that was impacted, followed by gangrene and perforation, presented a ten-minute sedimentation time with a leucocyte count of 21,000. An uneventful recovery resulted in this case subsequent to operation with the exception of a slight wound infection.

Two young patients having uterine bleeding from an indefinite endocrine disturbance had a secondary anemia. One patient had a 22 per cent hemoglobin with a sedimentation time of eighteen minutes. Her hemoglobin index, however, was +1. The other patient had 78 per cent hemoglobin with a −1 index. Her sedimentation time was two hundred minutes. This bears out the theory of the change in concentration of the plasma and the weight of the red blood cells being increased or decreased by the hemoglobin content.

There were 13 patients upon whom plastic operations and laparotomies for retrodisplaced uteri were done. In 4 of these the sedimentation time was under sixty minutes; the others were above sixty minutes, one hundred minutes being the slowest. The immediate operative results were satisfactory.

## SUMMARY

That the sedimentation time of the blood is a simple test, readily performed is unquestionably true. The rate of sedimentation, however, is easily influenced in diseases by absorption into the general circulation of unknown substances that produce a change in the chemical and physical balance of the blood elements. This balance is no doubt

readily upset, and this is especially so in all types of infection, thus rendering it a most delicate indication of the invasion of the human organism by disease. This is manifested by an increase in the speed of settling of the red blood cells, that responds to infection much more quickly than the increase in the number of leucocytes.

The increased rate of sedimentation does not, however, indicate the degree and virulence of the infection as shown in the 71 cases of adnexal infection reported above; neither from the observations made, does a low sedimentation time signify a bad prognosis. However, a steady lowering of the time means an increasing toxemia that may terminate fatally, yet it would be unwise to base a prognosis upon this one test unless substantiated by other reliable clinical manifestations.

As a diagnostic agent alone, it is untrustworthy in pelvic conditions, yet it may aid in influencing an already doubtful position to one that is more tenable.

In pelvic infections the leucocyte count, while not so readily affected or delicately influenced as the sedimentation time, is for this reason a more reliable indicator of the degree and virulence of the infecting organism, and, therefore, more dependable as a means to determine the most suitable time to interfere surgically.

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580 Park Avenue.

# REPORT OF A CASE OF DECIDUAL REACTION IN ADENOMYOMA OF RECTOVAGINAL SEPTUM

By Richard Joseph White, M.D., Fort Worth, Texas

THE following case, while not unique, is of sufficient rarity to excite general interest.

The patient, N. F., aged twenty-seven, married 6 years, was admitted to St. Luke's Hospital, New York City, August 9, 1921, on the service of Dr. Frank S. Mathews to whom I am indebted for the privilege of reporting the case.

*Chief Complaint.*—The patient had had backache for a year and a half with pain radiating down the legs which was exaggerated by standing. She had had one child and one miscarriage. Her last period was June 29. Periods were regular every twenty-eight days lasting, as a rule, three days; not profuse, but accompanied by severe backache.

Examination showed a poorly nourished woman in whom physical findings were essentially negative. Pelvic examination showed the cervix large and soft, and the fundus large and moderately retroverted. The posterior fornix showed a rough, warty plaque about 4 by 2.5 cm. in area, slightly elevated, situated in the midline with its long axis in the axis of the vagina, which looked very much like an area of beef tongue. Rectal examination showed the mucosa of the bowel uninvolved but the nodule easily palpable through the gut wall. It felt hard and nodular, like cicatricial tissue. She had been examined elsewhere and told that she had a cancer of the vagina. The cervix was smooth and without ulceration or erosion, and, because of the uncertainty of the diagnosis and the fear of disturbing a pregnancy, she was discharged to return in a month for further observation. She returned very much worried, and chiefly to relieve her mind and establish a diagnosis, the growth was removed.

*Operative Note.*—In the posterior fornix, just at the reflection of the vaginal mucosa from the cervix, and extending down on either side of the midline, was a papillomatous, more or less edematous looking growth, extending into the vaginal submucosa, but not into the rectum or cervix. It did not appear clinically malignant. The growth was removed in two or three pieces. The defect in the vaginal wall was sutured with catgut. She was having an uneventful convalescence with pregnancy undisturbed at time of her discharge.

As to the subsequent course, unfortunately nothing whatever is known, as the patient never reported to the follow-up department and our visiting nurses were unable to locate her at the address given the hospital.

*Pathologic Report* by Dr. L. C. Knox, resident pathologist St. Luke's Hospital. The specimen consisted of several small pieces of tissue from the cervix and vaginal wall. The largest was irregular, showed several small cysts, was fairly firm, and suggested tumor. Microscopically the section showed a small amount of smooth muscle and an irregular area of glandular tissue. The glands showed a tendency to become cystic, were lined with low cuboidal epithelium, and were surrounded by a small mass of flat cells which very closely resembled the uterine mucosa as it appears in the early months of pregnancy. This periglandular stroma was penetrated by dilated vascular sinuses, and hemorrhagic areas were frequent. These areas had broken into the lumina of the glands and contain fresh blood. There was a proliferation of the fibroblasts about the entire glandular area, and

a considerable area of round cell and polymorphonuclear infiltration. This was to be regarded as aberrant uterine mucosa undergoing the decidual reaction of pregnancy. *Diagnosis:* Decidual reaction in aberrant endometrium in the vagina.

The views of the earlier writers on this subject have recently been summarized by Winestine.[1] She states that Pick, particularly in the earlier investigations which he made of the subject, believed that these growths arose from the mesonephros. Herly,[2] in a recent article, shows some illustrations from Pick's early writings by which he demonstrated his ideas of the origin of misplaced endometrial tissue from what he calls pseudoglomeruli. Pick later gave up this view, according to Winestine, and came to believe that its true origin was from the superficial epithelium of the plica urogenitalis. Other writ-

Fig. 1.—Photomicrograph of area of tumor showing typical decidual cells.

ers have thought that such of these growths as were found in the celomic cavity might be attributed to a metaplasia of the mesothelial cells perhaps under the influence of chronic inflammation. Cullen is generally credited with the idea that these growths are derived from transplanted endometrial fragments. Sampson[3] has been the most prominent recent advocate of this view. Sampson[4] states that he has observed endometrial implants on the ovary in 45 out of 296 operations for pelvic disease in one year, and many others elsewhere in the pelvis and on the pelvic coils of intestine during the same period.

The most convincing evidence that endometrial tissue can be transplanted is the occurrence of adenomyoma in the abdominal incision following the opening of the uterine cavity or even the passing of a needle deeply through its substance and then through the abdominal

wall, as in ventral fixation. Cullen[5] reports three cases: one following an adenomyomectomy of the uterus and two following a cesarean section. Sampson[4] refers to a fourth case reported by Mallory, in which an adenomyoma developed in the abdominal incision several years after cesarean section. Nine additional cases arising similarly have been recently reported by Lemon and Mahle[6] of the Mayo Clinic.

Jacobson[7] has proved that this tissue can be implanted in animals, by opening the uteri of rabbits, removing fragments of endometrium, leaving them in the abdominal cavity and finding at later autopsies that the seeds had taken root and grown to form small tumors of endometrial tissue.

Their occurrence in the wall of the uterus may possibly be explained by the limited invasive power which this tissue is known to possess, particularly in the presence of a low grade chronic inflammation. The only real difficulty in this hypothesis is how to explain the occurrence of adenomyoma in the inguinal canal along the course of the round ligament.

The origin of these growths in the rectovaginal septum is the point of greatest interest in this case. Certain extensive ones that have invaded the bases of the broad ligaments have been thought to have been originally implants in the culdesac which have burrowed through. The intimate relations of the developing vagina and uterus to their embryologic ancestors, the müllerian ducts, is well known, and it is quite conceivable that a fragment of endometrial tissue might become displaced into the portion of the duct destined to form the vagina, thus giving rise to adenomyoma of the rectovaginal septum. On the other hand, in the light of the established fact that implantations do so readily occur in the peritoneum, it seems sensible to infer that adenomyomas of the septum may originate as implantations also. Of course the squamous epithelium of the vagina, in the intact state, is highly resistant to any type of injury and presumably to implantation. However, after an injury or abrasion sufficient to break the continuity of the epithelium, if menstruation were in progress at that time, there might be lodged on the raw spot a fragment of endometrial tissue extruded with the menstrual blood, which, taking root there, might manifest invasive powers of a greater or lesser degree and grow to the size of the tumor in the case cited, or even larger. Herly,[2] evidently impressed with the implantation theory, reports two cases of his own and mentions a third, recently seen in consultation, that developed adenomyoma in the septum following high forceps delivery with laceration and immediate repair. These, he suggests, may have developed from inclusions of endometrial tissue at the time of suture.

The case reported presents two points of special interest. First, the diagnosis: Our patient had been badly frightened by being told that she had a cancer of the vagina. There seemed no justification

for this diagnosis but it will serve to illustrate how little was known about these growths three or four years ago, for the attending staff failed to recognize the condition and could only say, correctly as the event proved, that they considered it nonmalignant. Herly[2] states that adenomyoma of the septum has been mistaken for hematocele, pelvic abscess, cancer of the rectum, and adherent adnexa in the pouch of Douglas. Our case resembled none of these.

Second, decidual reaction: Perhaps the most interesting feature of all was the decidual reaction. I have tried to present the evidence gathered by other men, tending to show that these tumors have the same structure and function as normal endometrium. That they menstruate or make abortive efforts in that direction has been shown by many authors, and the blood, old and fresh in the stroma and lumina of the glands, in the case reported is but one more illustration. Decidual reaction in these tumors has been reported, of course, but is still rare enough to excite interest. The cases of Cullen, Griffith, and Winestine are examples. There is every reason to suppose that there is decidual reaction in all these tumors in pregnancy with one possible exception. Sampson[4] holds that some of the peritoneal implants take their origin from the extruded tubal mucosa. If this be true, we would not expect decidual reaction in them because, though there is decidual formation in the immediate vicinity of the ovum in ectopic pregnancy, there is no tubal decidual reaction in a normal uterine pregnancy. The reason there are so few cases of decidual reaction on record is not, I believe, because of their actual rarity but because of the infrequency with which surgery provides material for pathologic study during the course of a pregnancy. The condition is an excellent example of a hormone or chemical agent acting at a distance.

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606 Penn Street.

# REPORT OF A CASE OF SEPARATION OF THE DORSAL VERTEBRAE IN PODALIC VERSION AND EXTRACTION

By W. R. Barney, M.D., Cleveland, Ohio

IN my clinic* the average number of podalic versions and extractions per year is 151. This case represents the first accident of this particular type that has happened here. The available literature states that injuries to the cervical vertebrae are fairly common but that injuries to the dorsal vertebrae are comparatively rare and that when they do occur it is in the lower dorsal vertebrae. In this case the accident occurred in the mid-dorsal region.

History.—A colored primipara, eighteen years old, presented herself at a prenatal clinic March 10, 1925, and was under observation continually till the time of delivery, July 27, 1925. Her last menstrual period was October 16, 1924. Quickening could not be definitely recorded. Her measurements were normal and the blood Wassermann negative. The last time she was seen in the prenatal clinic on July 9, 1925, the breech was in the fundus, the dorsal plane on the left, small parts on the right, head floating, and the fetal heart was heard in the midline.

*Labor History.*—On July 27, she presented herself at the hospital at 4:00 A.M., and was admitted to the labor room. She said that her pains started at 4:00 P.M. July 26. Shortly after admission the membranes ruptured. External palpation revealed no change from the last findings in the prenatal clinic. Rectal examinations showed dilatation equal to two fingers at 6:30 A.M. At 6:45 A.M. the pains were increasing rapidly in intensity, duration, and frequency, and at this time she was put on morphine-scopolamine routine: Morphia gm. 0.01, and scopolamine gm. 0.00045, by hypodermic at once; scopolamine gm. 0.0003, forty-five minutes later, followed by scopolamine gm. 0.00016, q. 90 minutes. Dilatation progressed satisfactorily but the head did not engage. However, delivery was anticipated in three quarters of an hour; so the scopolamine was discontinued and ether analgesia given during the pains. After three hours in the second stage no progress had been made, the head remaining fixed in the posterior position; and being moulded very well, operative delivery was decided upon.

*Operative Procedure.*—After examination under anesthesia it was thought that there was no disproportion between the head and pelvis; as the head was not engaged, a version and extraction was decided upon and, under deep anesthesia, was very easily done. Both feet were drawn down and there was some difficulty getting the hips down, although the cervix was fully dilated. Moderate traction, no rotation, was applied directly in the axis of the superior strait and just as the hips were coming under the symphysis something in the baby gave way with a "crack." After the hips were engaged, they slipped through readily, the arms were easily delivered and the after-coming head, being turned to an oblique, came through with practically no effort at all. The operative procedure was not difficult at any stage. The cord was pulsating about 80.

With artificial respirations the heart rate picked up to 130 and the pulse was good. The child would gasp approximately once every thirty seconds with or without artificial respiration. While flexing the thighs on the abdomen definite crepitus was palpated in the upper dorsal region of the spine, although no deformity

*The Maternity Hospital, Cleveland.

was noted. After working three hours it was noted that the respirations were not improving and the mucous membranes were rather pale. Oxygen was used and the baby put into an incubator where the respirations gradually declined and ceased four and one-half hours after delivery.

*Autopsy.*—The baby weighed 3500 grams and measured 54 centimeters. In the right chest there was a small quantity of free blood. The posterior mediastinum was filled with blood clots, less hemorrhage extending in the prevertebral region up to the fourth cervical vertebra. This extended down in the retroperitoneal region to the third lumbar, while the retropleural hemorrhage extended to the midscapular region from the second to the tenth rib. All the viscera were normal. Along the spinous processes of the vertebrae from D2 to D7 was free blood and the muscles dissected away from their attachments revealed the disarticulation of the fourth and fifth dorsal vertebrae. There was no fracture and no irregularity of the articular surfaces. The laminae were then removed from the lumbar region to the foramen magnum and the spinal canal was found filled with clotted blood from the first lumbar to the third cervical. There was no epidural blood. The meninges were then opened and there was a very slight film of clotted blood from the level of the eighth dorsal vertebra up to and including the cerebellum. There was no hemorrhage in any portion of the cerebrum.

This case is reported because of the rarity of the condition, viz., a separation of the fourth and fifth dorsal vertebrae with no fracture, occurring during an operative delivery in which no undue force was used. The cause of this accident is open to speculation, but it is likely that there was an inherent weakness in the union of the fourth and fifth dorsal vertebrae.

503 Osborn Building.

# Society Transactions

## NEW YORK OBSTETRICAL SOCIETY

*MEETING OF MAY 12, 1925*

THE PRESIDENT, DR. REGINALD M. RAWLS, IN THE CHAIR

DR. THOMAS C. PEIGHTAL (by invitation) presented a paper entitled **Postoperative Parotitis, with a Report of Cases.** (For original article see page 88.)

### DISCUSSION

DR. HARBECK HALSTED.—In the last five years at the Sloane we have had six cases of parotitis, divided equally among the obstetric and the gynecologic cases. All of the former were otherwise complicated. There was one cesarean section that developed a cystitis, phlebitis and right parotitis approximately at the same time. The parotitis had to be incised. Shortly after the patient developed pneumonia. Eventually she recovered completely. I might say that with the exception of two bilateral cases all were right-sided. The second obstetric case presented hypothyroidism and some vomiting. The patient had had toxemia with a previous pregnancy. She came into the hospital for anemia and was transfused. The transfusion was followed by true anuria for a few days. She developed rash and within thirty-six hours, a right parotitis which became so massive that it was incised. Although there was no free pus at the time, the gland tissue was described, as necrotic with some necrotic fat tissue over it, and it began to discharge within twenty-four hours after incision. Drainage ceased in about three weeks and the wound healed up shortly after. The third obstetric case entered with vomiting, although the patient was seven months pregnant. She had an enormous hydronephrosis with a double pyelitis. We tried to drain the kidney by catheter, but were not successful, and so induced labor. Twenty-four fours after delivery she developed a right parotitis which progressed to the point demanding incision. The hydronephrosis drained out, the parotid subsided rapidly, and the patient recovered. The baby lived in this case, in the case before it was macerated.

Of the three surgical cases, one was an acute salpingitis, of unknown cause, with a cystic ovary that was removed. The patient developed a right parotitis which had to be incised and a large amount of pus freed. This was the only case that developed facial paralysis, which cleared up in four months. Of the two others, one was a clean retroversion and the other was a tremendously complicated plastic, in which we had to incise both sides. The only one not incised was the retroversion case in which a double parotitis developed. After the application of heat both sides rapidly subsided, and I believe in future we will try applications of heat first.

Out of these six cases, then, five were incised and the six patients made perfect recoveries.

DR. F. R. OASTLER.—Several years ago, in six months, I had seven cases of infectious parotitis following operation. Some of them were cases of septic origin; others were practically clean. It seemed to make no difference. At first I thought

there was something wrong with the anesthesia and we had everything sterilized before giving an anesthetic, but with no better results. Following that, I came to the conclusion that possibly the dry mouth had something to do with it. Therefore, we made it a routine procedure that the day before and the day of operation the mouth should be thoroughly cleansed with an antiseptic and the teeth carefully scrubbed. I am satisfied that the condition came from a dirty mouth in every case which I have personally seen.

One other thing about treatment. Massage of the gland is a mistake, but massage of Stenson's duct I consider of extreme value, gently done every three hours, not touching the gland at all.

DR. H. C. COE.—In twenty years' service at Bellevue Hospital and twenty-five years at Memorial Hospital, I cannot recall a single case of suppurative parotitis, and certainly in the early days we did not trouble much about the teeth or the mouth. The first case I saw was at the Woman's Hospital, where we are exceedingly careful about cleansing the mouth. I had to operate twice on the patient and made a counter-opening in the neck on the left side and incised the other parotid. We could not find any cause for the condition in this case, but it undoubtedly came from the mouth.

DR. HERMANN GRAD.—I have in mind two cases, one at the Woman's Hospital and the other on the outside, associated with a very extensive peritonitis following infection from the introduction of a stem pessary used to prevent conception. The patient also developed an empyema after this, requiring resection of the rib, and about ten days later a right-sided parotitis, with very extensive suppuration. It broke into the external auditory canal and had to be incised.

In the other case the woman had a uterine suspension done, and developed a mild septic condition, which was followed by extensive suppuration of the right parotid gland.

DR. E. C. LYON., JR.—At the Woman's Hospital on the obstetric service occasionally, we see a case of parotitis, but as yet we have not had one that went on to suppuration.

In my own practice, I had one case of mild parotitis following pernicious vomiting, in which therapeutic abortion was done.

DR. FREDERIC C. HOLDEN.—As regards the Bellevue Hospital service, I would like to add that in the last 2,000 gynecologic operations we have had no postoperative parotitis. We have had quite a number which developed in the postabortal and postpartum service. Many of these people have very poor oral hygiene.

DR. PEIGHTAL (closing).—If there is any doubt at all, an incision should be made as the given mortality in this condition is rather high (33⅓ per cent).

I was interested to hear Dr. Oastler had been using preventive measures for almost three years and that some improvement resulted in the number of cases. I quite agree with him that it is not a good practice to massage the gland. I merely mentioned that point because it had been brought out by several authors. I think that massage of the duct in an attempt to open it and get drainage that way, especially in the early and mild cases, is a very important point.

Having looked over the literature and seen these cases at Roosevelt Hospital, at least five of which I saw personally, I cannot help but feel that the etiology of this condition lies pretty much within the mouth and that the organisms lying in the mouth and in Stenson's duct cause this process, and that the reason they extend up into the gland and out through the perilobular tissues is usually because the duct has been plugged.

I was rather interested to hear about Dr. Lyon's case of pernicious vomiting. The case I mentioned that Manton spoke of also had a therapeutic abortion.

I want to bring out one point. Deaver in 1915, stated that he felt the anesthetic in a large measure was a very definite factor in some of these cases, but almost immediately thereafter a number of men all over the country refuted that statement, especially men who had public hospital services, where practically the great proportion of their patients were alcoholics but found no increased incidence of this complication.

DR. H. C. WILLIAMSON presented a paper entitled **Application of the Forceps to the Transverse Head for Delivery of Persistent Occipito-posterior Cases.** (For original article see page 37.)

DISCUSSION

DR. H. C. WILLIAMSON.—I would like to say in response to Dr. Davis that episiotomy is not done as a routine. In some of the cases of difficult forceps, by doing an episiotomy and allowing the handles of the forceps to drop back, they come out very much more easily.

DR. H. R. CHARLTON (by invitation) presented a paper entitled **Massive Congenital Hernia at the Linea Alba and Its Immediate Treatment.** (For original article see page 103.)

DISCUSSION

DR. H. B. MATTHEWS.—My own case apparently was one of patent omphalomesenteric duct in which the ileum—and perhaps jejunum had remained and become adherent so that, when I cut and tied the cord, the small gut was included in the tie. The case in question was a perfectly normal spontaneous labor occurring at the Long Island College Hospital. Four or five days later the baby developed all the symptoms of intestinal obstruction and died. Autopsy showed where we had cut and tied the ileum and this was the cause of the obstruction. The cord looked perfectly normal; you could not have told that there was any ileum in it by external or any other examination.

DR. J. A. HARRAR.—The thing which surprises me most, is the infrequency of this condition as reported. At the Lying-In Hospital where we have a service of between 5000 and 5500 cases a year I am sure we have three or four of these in every 5000 deliveries. Dr. Ballantine calls them gastrectasis, perhaps two-thirds of those are of so extensive a nature that the liver and the entire abdominal contents are in the sac.

I had one case several years ago where the opening was about two inches across. The baby was premature and I did not feel it would stand operation. By the use of sterile gauze and pressure over this area, in a few days it gradually contracted and when the baby was about to be discharged at the end of the second week it looked not unlike an ordinary umbilicus. In the smaller hernias it is possible to cure the condition without operation, although operation is the method of choice.

DR. CHARLTON (closing).—The type of case which Dr. Matthews described where the ileum is in the sac, has several times been reported and before tying off any cord, its proximal portion should be carefully inspected. If there is any bulging it is advisable to tie well away because retraction will go on.

So far as Dr. Harrar's statement of the frequency of this condition is concerned, De Lee remarked in his note to me that they also had frequent cases of gastrectasis, but that is a different type. That is one of the split formations comparable above to the same abdominal congenital fissure below.

I meant this paper particularly to cover those operable conditions in and about the site of what would have been the umbilicus.

DR. MEYER ROSENSOHN (by invitation) presented **An Analysis of Cases in the Service of the Lying-In Hospital.** (For original article see page 96.)

# Department of Reviews and Abstracts

Conducted by Hugo Ehrenfest, M.D., Associate Editor

## Collective Review

### New Books

By Robert T. Frank, A.M., M.D., F.A.C.S., New York City

Seelig[1] has presented us with a most charming and readable outline of the history of medicine. Any one whose interest in the history of medicine fails to be permanently aroused by this lifelike resurrection of past epochs may be classified as hopeless. Even the most blasé and matter of fact medical student, who lives solely for and in the prospect of a lucrative practice, may be stirred. The book is a real achievement in that it elevates a subject which can be presented in a cut and dried manner, into the absorbing and gripping present.

Flexner[2] has long since, although a layman, earned the distinction of being an expert on the subject with which he deals. The book is not only worth while because of its excellent method of presentation, but also because of the exhaustive fashion in which the entire field of secondary education, premedical training, and medical education is dealt with. Science, as Flexner puts it, is essentially a matter of observation, inference, verification, and generalization. Throughout, the author emphasizes the similarity of the practitioner and investigator when both are actuated by the proper spirit.

"Medical education must be conceived as primarily the effort to train students in the intellectual technic of inductive science" and Flexner traces this medical education from beginning to end. "Scientific medicine in America—young, vigorous and positivistic—is today sadly deficient in cultural and philosophic background."

The French and English emphasize the clinical side of medicine. Lately in England so-called "teams" have become the fashion. In Germany, the true university idea of medical education has been most fully developed. German medical science appears to have reached its zenith in 1910. Since then it has either stood still or gone backward, because the war has administered a serious check to university medicine in Germany.

He deals in great detail with secondary education in the various countries. In Germany, such secondary education is continuous, carefully planned, and scrupulously carried out, so that the medical students in that country form an even, well-rounded group. In England, selection of the student body is less careful, but the English teachers concentrate their efforts upon the brilliant and efficient student, pushing

[1] **Medicine, An Historical Outline.** By M. G. Seelig, M.D., Williams & Wilkins Company, Baltimore, 1925.

[2] **Medical Education, A Comparative Study.** By Abraham Flexner. The Macmillan Company, New York, 1925.

the less promising material to the side. In America, the student groups are often gathered haphazardly, with today a tendency of selecting the student body "from the right sort of people" frustrating many worthwhile students because they come from "the wrong people." This often produces a serious social loss because superior opportunities are lavished upon the stupid or indolent for no other reason than that they are of "the right sort." In the United States it is often the case that a student is valued highly because he is a good fellow rather than a good scholar. Flexner says, "The truth is that, until high school and college do their job better, the medical school cannot find a homogeneous group at the proper level."

Three types of medical schools are described: (1) the clinical type, characteristic of France and England of today; (2) the university type of which the German university medical schools are the best example; and (3) the proprietary type once flourishing in this country but now happily obsolete.

The author enters fully into the function of the outpatient departments as adjuncts and feeders of the medical school. He deals with the university hospital and its partial substitute, hospitals more or less connected with the university by means of special arrangement and teaching staffs. He compares the English apprentice system with the French methods, deals with judgment and leniency with the makeshift American system of part-time instructors, but appears to favor the full-time university professor as exemplified by the German universities.

The immense amount of detail in this instructive volume is handled with wonderful dexterity. I only regret that Flexner did not see fit to summarize his generalizations and perhaps to indicate more clearly what he considers the proper mode for future development along safe and sane lines.

## GYNECOLOGY

Three entirely dissimilar books treating of the same subject from different points of view are *Gynecological Operations* by Franz, the third edition of Crossen's *Operative Gynecology*, and the fifth edition of Döderlein and Krönig's *Operative Gynecology*.

Franz's book[3] may be described as his surgical autobiography. Franz, who is now director of the University Woman's Clinic, Charité, in Berlin, incorporates the result of his gynecologic work both in Jena and Berlin. The results embrace 6114 operative cases. The book is an atlas of operative technic, as well as a brief but vivid collection of case histories. Most of the illustrations of the operative field were obtained by color photography. On the opposite page there is a line drawing of the photograph with descriptive captions. Except in a few pictures, where the vivid red overshadows and obscures the outline, the color process has proved both artistic and instructive in its results.

Franz is a writer whose style is unassuming and yet incisive. His introduction emphasizes that the operator should realize that operation in itself is not infallible and that operation should not be overvalued; that in making indications, the disease should be more dangerous than the operation; that it is impossible to be both general surgeon and gynecologist. He modestly confesses that he has considerable difficulty in keeping abreast of gynecology alone.

[3] **Gynaekologische Operationen.** Von Dr. Karl Franz. Verlag von Julius Springer, Berlin, 1925.

The book is so replete with valuable facts that I do not hesitate to abstract it at some length. The operator uses rubber gloves over which cotton gloves are drawn,—an unnecessary complication in my opinion. His peritonitis statistics are not encouraging, 49 operations with 24.5 per cent recoveries. In the statistics of spinal anesthesia, 6015 cases show 7 cases of meningitis. He does not use this method for the very old. I am pleased to see that Franz prefers the Alexander-Adams operation and that he employs it to bring forward the uterus even when the abdomen has been opened for intraperitoneal manipulations. For prolapse he uses anterior and posterior colporrhaphy combined with the Alexander operation. He has long since discarded hysterectomies in cases of prolapse. Most of his abdominal work is done through the transverse Pfannenstiel incision. To my surprise, he punctures both malignant and nonmalignant ovarian cysts to facilitate their removal. His attitude towards inflammation of the adnexa, with the sole exception to be mentioned, is most praiseworthy. Of 847 inflammatory cases, only 45 were operated. On the other hand, he operates at once on tuberculous adnexal tumors and tuberculous peritonitis. This appears a grave mistake to me, and his statistics of 23 operations with 4 fatal outcomes, does not lend support to his attitude. Like all well-trained gynecologists, Franz admits that the diagnosis of ectopic pregnancy is not always easy. He has had 255 ectopic cases and 17 exploratory laparotomies for ectopics, where none were discovered. This large number of explorations is due to the fact that Franz refuses to perform an exploratory puncture. Of 3176 myomata of the uterus, 1141 were operated upon, that is, he operated on 35.6 per cent of the cases and radiated 19.4 per cent. His operative mortality was 2.1 per cent. Among the myoma operations, 9 proved to be sarcomatous, and in 12, corpus carcinomas were discovered. Franz has continued to operate upon carcinoma of the cervix and only uses radio therapy when the condition is inoperable. Eighty-two per cent of his cases proved operable. Franz has 800 Wertheim operations to his credit. From 1905 to 1909 the mortality was 19.9 per cent. From 1911 to 1921, 14.1 per cent died. His permanent cures vary between 38 and 41 per cent according to the grouping, but according to Winter, the permanent cures are distinctly less.

Besides the subjects specially mentioned by me, the book is replete with information and will repay careful reading by all of those interested in both the technical and scientific side of gynecology.

In contrast to the preceding very personal volume, Crossen,[4] as heretofore, offers encyclopedic reference to all gynecologic operative work with especial attention to technical details. The present edition has ninety new illustrations, making the number of illustrations eight hundred eighty-seven. A tremendous amount of material is handled in a strictly impersonal fashion except where, as an introduction to each type of procedure, the indications for selecting a given technic are presented. Practically every operation is referred to except those which have become superannuated. The sole exception to this is the Stoekel-Goebel operation for incontinence and Bumm's colli-fixation as well as promontory fixation, neither of which technics are much used in this country. Crossen's book continues to be an exhaustless mine of information, which is of equal value to the beginner and to the well-trained

[4]**Operative Gynecology.** By Harry Sturgeon Crossen, M.D., F.A.C.S. Third Edition. The C. V. Mosby Co., St. Louis, 1925.

and finished gynecologist who desires to refresh his memory on some operation which he rarely practices, or desires help in selecting the proper procedure.

It would seem to me advisable either to give a comprehensive review of the literature or, if this dos not seem feasible, to omit all literary references. The authors quoted appear to have been selected at random and therefore an injustice is done to those whose work has not been acknowledged. This applies especially to such subjects as operations for retrodisplacement and prolapse of the uterus. In describing the operation for repair of the pelvic floor, Crossen again and again refers to the "musculo-fibrous sling." This together with his illustrations leave me in doubt as to whether he is describing levator suture, or simply favors the approximation of the fasciae which cover the levator and the deep transverse perineus muscle. The description of vesicovaginal fistula, it seems to me, could be simplified as well as clarified by dividing the technics into, for instance, (1) the denudation of the edges according to Sims, (2) mobilization by flap splitting, (3) mobilization by abdominovaginal procedures including hysterectomy, and (4) substitution, as for example the interposition operation.

Crossen's book doubtless will continue to enjoy its well-deserved popularity among the profession.

Döderlein and Krönig's *Operative Gynecology*[5] does not in any way fall behind its well-known predecessors. Döderlein, the survivor, is the sole editor. He has been assisted in the chapter on anesthesia by Dr. Erwin Zweifel and in an important final chapter, dealing with the medico-legal aspect of both operative intervention and nonintervention, written by Professor Ernst Beling. Unfortunately this last chapter is limited to the German code. Few changes on the whole, in either text or illustrations, mark this fifth edition. Of the newly devised operation, Bumm's colli-fixation, Schubert's formation of a vagina by means of the lower rectum, Stoeckel's pyramidalis transplantation for incontinence, are the best examples. Functional uterine hemorrhages are now entirely relegated to the radiotherapist, a striking commentary of the open-mindedness of Döderlein, the surgeon. The author has obtained as good results from radiation of carcinoma of the cervix as from operation. His statistics, which extend over a period of five years, show that there is no operative mortality and that a number of cases which, from their extent, must be considered inoperable, can be saved by the x-ray. No new or illuminating statistics from the German clinics have been incorporated in the new edition. This book is of such sterling worth that whenever in doubt the gynecologist may turn to its pages for illuminating advice as to technical measures as well as for new points of view in nonoperative interventions. Only in one chapter of gynecology has Döderlein drifted behind the times and that is in the treatment of relaxation of the anterior and posterior vaginal walls. The operation for cystocele is archaic. The rectocele operation still considers the almost discarded technic of levator suture instead of approximation of the fasciae covering this muscle.

Another series of installments of Halban and Seitz's[6] encyclopedic work has appeared. Installments 13, 14, 15, 16 and 17 contain parts of volumes v, vi, and vii.

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[5] **Operative Gynakologie.** By Döderlein-Krönig. Fifth Edition. Verlag von Georg Thieme, Leipzig, 1925.

[6] **Biologie und Pathologie des Weibes.** Von Prof. Dr. Josef Halban, and Prof. Dr. Ludwig Seitz. Urban & Schwarzenberg, Berlin, 1925.

13. Nürnberger describes echinococcus, actinomycosis and bilharziosis.

To Weibel has been assigned the subject of tuberculosis of the genitals. Some beautiful colored plates illustrate this chapter. The author describes both operative and expectant treatment but stresses especially roentgenotherapy, using 20 to 30 per cent of H.E.D. every four to eight weeks through large fields.

The subject of gonorrhea is taken up by Wagner. He does not begin treatment of a fresh infection until two or three weeks have elapsed.

14. Placentation is discussed by Grosser. He places follicle rupture in the human species at about the tenth day after menstruation. Dietrich takes up the anatomy and physiology of the fetus, as well as the biology of the placenta.

15. In this number the relation of the various organ systems to the female genital tract are discussed—eye disease (J. Novak), circulatory apparatus (v. Jagié), hematopoietic organs and blood (Hickl), liver and kidney (Eckelt) and finally the value of the blood sedimentation test (Linzenmeier).

16. Normal labor is dealt with by Sellheim, whose illuminating explanations of the mechanism of labor are well known.

Engelhorn has a short chapter on multiple pregnancy and labor.

17. The last installment to be considered contains four topics.

Matzenauer takes up syphilis, soft chancre, and skin lesions of the vulva. Twelve colored plates illustrate his text. There are no references to the literature.

Martin's short but well-written chapter describes the pelvic connective tissues and their diseases.

Freund covers the diseases of the abdominal wall, ligaments, blood vessels, and nerves of the female genital apparatus.

Sternberg describes ovarian tumors.

A critique of this monumental work will be attempted when all the material is at hand. In size and scope it already has left all its predecessors far behind.

A number of monographs dealing with special phases of gynecology deserve comment.

Cumberbatch and Robinson[7] have given us a small book dealing with the *Treatment of Gonococcal Infection by Diathermy.* They give a full description of the technic, the proper method of selecting cases in both male and female, and a certain number of case histories as illustrations. Their best results have been obtained in infections of the urethra and cervix of the female, and in prostate cases in the male, especially in cases which had resisted all other forms of treatment. They also obtain relief in gonococcal arthritis. The authors do not believe that the effect is due solely to a thermal death of the cocci although heat of approximately 115 degrees Fahrenheit can be reached in the urethra and 120 degrees in the cervix. This therapeutic measure, which is still *sub judice,* may prove of value in selected cases.

Fulkerson,[8] in small compass, details the technic of endoscopy and cystoscopy in the female. Chapters on renal function tests, diathermy, and acidosis are of special interest. Most of the illustrations (some from well-known textbooks) are excellent. A few of the line drawings, such as Figs. 121, 123, and 124 are crude.

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[7] **Treatment of Gonococcal Infection by Diathermy.** By Dr. E. P. Cumberbatch, and Dr. C. A. Robinson. C. V. Mosby Company, St. Louis, 1925.

[8] **Gynecologic Urology.** By Lynn Lyle Fulkerson, M.D. P. Blakiston's Son & Co., Philadelphia, 1925.

The second volume of Paramore's *Statics of the Female Pelvic Viscera*[9] is really an historical review of the treatment for prolapse of the uterus. In Part I the inception of plastic procedures is discussed, including the treatment by pessary from the year 1743 on, through the groping attempts of Hall, Jobert, and Baker Brown. Part II deals with the modern efforts at cure, beginning approximately around 1860 and sponsored by Huguier, Kückler, Tait, and Emmet. Part III deals with the more modern vaginal operations which include the work of Sims, Emmet, Hart, Hegar, and Le Fort. The fourth and last part takes up the conception of prolapse as a hernia and brings us down to the end of the last century. To those interested in historical medicine, this review, although not too exhaustive, should prove of value.

Liepman,[10] who has shown an increasing interest and insight in the field of psychology as applied to gynecology, has written a new brochure entitled *Gynecological Psychotherapy*. It appears to me that he has erred in attempting to include the entire subject of psychology in this small monograph and hence has but a bare fourteen pages to devote to therapeutic measures.

Liepmann's method of searching for a phylogenetic structure upon which to base the workings of the mind is laudable; his attempt at phylogenetic synthesis is praiseworthy; his law of "threefold basis" (dreifachen Grunde) is, without his realizing it, purely and primitively symbolistic. To say that "to the uninjurable male one contrasts the vulnerable female plasma," to base the vulnerability of the female upon the penetration of the spermatozoan into the ovum (mainly a chemical union), upon the tearing of the hymen at defloration, and upon the monthly rupture of the ovarian follicle, is pure phantasy! His review and application of psychology is intelligent, stimulating, and beautifully expressed. His characterization of cubism—the schizoide art—is delightful. The adult and formed mind will derive profit from perusal of this book. To the student and adolescent medical learner the monograph presents many pitfalls because it glosses over what is least understood and hence presents, as completed, a discipline which is as yet in embryo.

Kretschmer's booklet[11] on hysteria, which appeared in 1923, is based on the thesis that hysteria is an abnormal reaction to the traumata of existence, usually with a distinct ulterior aim, such as war-hysteria or pension-hysteria. The various hysterical phenomena are analyzed in a simple and understandable fashion.

Another book of Kretschmer's,[12] of which the second edition was published in 1922, deals with *Psychology for Medical Men*. The soul, impulses and temperament, personality and reaction are described. This little book is of interest and value to the physician.

A number of new editions of well-known textbooks require but briefest mention.

Hirst's *Gynecology*,[13] in its second edition, attempts, with some suc-

[9] **The Statics of the Female Pelvic Viscera.** Dr. R. H. Paramore. Volume ii. H. K. Lewis & Co. Ltd., London, 1925.

[10] **Gynaekologische Psychotherapie.** Von Dr. Med. Wilhelm Liepmann. Urban & Schwarzenberg, Berlin, No. 24. 1924.

[11] **Ueber Hysterie.** Von Dr. Ernst Kretschmer. Verlag von Georg Thieme, Leipzig, 1923.

[12] **Medizinische Psychologie.** Ein Leitfaden für Studium und Praxis. Von Dr. Ernst Kretschmer. Second Edition. Verlag von Georg Thieme Leipzig, 1922.

[13] **A Manual of Gynecology.** By Dr. John Cooke Hirst. Second Edition, Revised. W. B. Saunders Company, Philadelphia, 1925.

cess, to incorporate within its small compass the very newest acquirements. Of its kind, the book is good, clear, and sound. The grouping of Sampson's implantation cysts as derived from the oophoron, and serous, and pseudomucin cysts from the paroophoron, appears bizarre. The chapter on endocrines is far from sound or critical.

The third edition of the late Professor Boursier's Textbook of Gynecology,[14] of which the second edition appeared in 1918 in Testut's new library for students of medicine, has been brought up-to-date by Auvray. This somewhat bulky, though small, two volume edition is strictly practical and elementary. The description of the physiology of the menstrual cycle leaves much to be desired and therefore the treatment of functional diseases is likewise not up-to-date. Otherwise the book is satisfactory, the surgery being especially well described.

Jellett's *Practice of Gynecology*[15] has reached a fifth edition. This new edition has taken up the subjects of the Rubin insufflation test, ovarian transplantation, Sampson's adenoma of endometrial origin, sterility, and the Manchester operation for uterine prolapse (Donald's anterior colporrhaphy with excision of the anterior vaginal fornix). The book has a very excellent description of operative methods. The new edition has brought this volume fully up-to-date.

The second edition of Runge's *Gynecology for the Practicing Physician*[16] is approximately the same as that of the first, which appeared only a year ago. The book is written in the form of case histories, the discussions being most illuminating.

## OBSTETRICS

The second and third volumes of Döderlein's *Handbuch der Geburtshilfe*,[17] together with the supplement, have now been issued. The three volumes form over 3200 pages of text, with more than 675 illustrations. We must consider this "handbuch" as a worthy substitute and continuation of the classical one edited by Von Winckel. The best talent in German speaking countries has taken part in this second edition. The first volume has been previously commented upon.

Volume II treats of the pathology of pregnancy, the first part was written by Otto Küstner, the second, by Ludwig Seitz. The late J. Veit contributed the chapter on extrauterine pregnancy, brought up-to-date by Weber. The pathology on labor has been written by Zweifel and Baisch.

Volume III contains the subject of puerperal fever (Zweifel), the operative treatment of this disease (Weber), puerperal bleeding (Siegel), inversion of the uterus and sudden death during the puerperium (both by Zangemeister). Weber discusses inflammation of the breast; Ibrahim, diseases of the newborn; Stoeckel, the urinary organs during pregnancy, labor, and the puerperium. The nervous and psychical disturbances of labor, pregnancy, and the puerperium are taken up by Siemerling, and a most important subject, that of the legal aspect of obstetrics, has been assigned to Kockel. This volume also contains a complete index, including an authors' index.

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[14] **Precis de Gynecologie.** Par André Boursier. Volumes i et ii, Third Edition. Paris, Gaston Doin, Editeur, 1925.

[15] **A Practice of Gynaecology.** By Dr. Henry Jellett. Fifth Edition. Lea & Febiger, Philadelphia, 1925.

[16] **Die Gynaekologie des Praktischen Arztes.** Von Dr. Ernst Runge. Second, Revised Edition. Urban & Schwarzenberg, Berlin, 1925.

[17] **Handbuch der Geburtschilfe.** By A. Döderlein. Second Edition. Verlag von J. F. Bergmann, München, 1925.

The supplemental volume is devoted to operative obstetrics. All in all the "handbuch" is fully on the level with Von Winckel's valuable textbook and should be found on the shelves of every obstetrician. The work is too tremendous in size and scope to permit of a detailed review.

American readers of today must realize that continental authors either cannot or will not keep up with American (thereby including both North and South American) literature; that the readers of foreign textbooks will therefore only be kept abreast with the European literature, and that they must seek American sources in order to keep posted on our own advances. This fact will increasingly mitigate the reading and purchasing of foreign books by Americans.

A number of interesting monographs, which well repay careful perusal are now to be discussed.

Warnekros[18] has published an atlas of x-ray pictures illustrating labor, including the third stage. Thirty-one excellent reproductions of the x-ray plates accompany the text. By overloading a soft tube, a mixture of hard and soft rays is obtained which bring out the fetal bones with great definiteness, the exposure lasting only from two to three seconds. These plates will be of particular interest to the teacher of obstetrics. To me, the most striking feature consisted in noticing the comfortable position assumed by the fetus *in utero*.

Scemla's monograph[19] deals with the respective merits of symphyseotomy and cesarean section, with "temporary exteriorization" of the uterus in the presence of infection. This operation consists of bringing part of the uterus outside of the abdominal wall and shutting off the peritoneal cavity behind it; then emptying the uterus and leaving it outside of the abdomen for a variable period of days until involution has taken place. Whereupon the site of the uterine hernia is débrided and the resutured uterus allowed to slip back into the pelvis, the abdominal wound being closed without drainage.

Two German pamphlets dealing with the same subject, namely, the increase of induced abortion in Germany, portray approximately the same point of view. Vollmann,[20] like all observers in this field, emphasizes the tremendous increase in induced abortions since 1890, which, roughly speaking, appears to have increased from fifteen to thirty-eight per one hundred. He advises that the state offer inducements for having children by relief from taxation, special monetary help, and greater ease in obtaining habitations, which appear to be at a discount in the larger cities of Germany.

Weinzierl[21] takes up particularly the unmarried mother. He made a study of five hundred such cases and emphasizes the fact that thirty of this number made serious attempts at suicide because of their despair. He considers that elevation of the mental and moral plane, social aid agencies and particularly the promulgation of new laws would provide remedies. He favors such laws as Denmark has inaugurated, which place the care of generative activities of woman under the eyes of the state. How successful such measures would turn out to

[18] **Geburt und Nachgeburtsperiode im Roentgenbilde.** By K. Warnekros. Verlag von J. F. Bergmann, München, 1925.

[19] **Indications Respectives des Pelvitomies et de la Cesarienne suivie D'Exteriorisation Temporaire de L'Uterus.** Par le docteur Jules Scemla. Gaston Doin, Editeur, Paris, 1925.

[20] **Die Fruchtabtreibung als Volkskrankheit.** Von San.—Rat Dr. Vollmann. Verlag von Georg Thieme, Leipzig, 1925.

[21] **Die Uneheliche Mutterschaft.** Von Dr. Egon Weinzierl. Urban & Scharzenberg, Berlin, 1925.

be, appears hard to foretell; nor can I consider the apparent or real increase of induced abortions as necessarily indicating decadence such as both of the authors believe it to show. More likely the greater care in studying such conditions accounts for much of this apparent increase. This, let us hope, together with the temporary postwar changes in the social structure, as well as the economic distress engendered by the conflict appears to be largely causative.

Frey[22] has written a very important little monograph on *Heart and Pregnancy*. The material on which this work is based is that of Stoeckel, of Kiel, who placed at the author's disposal one thousand cases, of which, of course, only a minimum number suffered from heart trouble. Frey suggests that both gynecologists and internists, heretofore, have been too lenient in advising interruption of pregnancy. He demands that signs of decompensation, such as cyanosis and dyspnea, as well as signs of recent acute inflammatory endocarditis (such as tachycardia, secondary anemia, elevations of temperature) to be present before intervention is practiced. He emphasizes that in his opinion mitral stenosis should not be considered from a different point of view than other heart lesions. This little monograph well repays study.

The following new editions of textbooks on obstetrics have been received.

The third edition of Bourne's *Synopsis*[23] has added gynecology to the original obstetrical text. It is brief, in small print, and contains many facts as well presented as this unfavorable mode of writing will permit. The purpose is to supplement the larger textbooks.

The sixth edition of Eden's well-known *Textbook of Obstetrics*[24] has been revised by Eardley Holland. The revision has been judiciously performed so as not to alter the smoothness of the text. This edition, like previous ones, is fully abreast of its time. I take issue with the authors that a "fertilized ovum may be successfully implanted upon a quiescent endometrium" (page 6). Unless all of our comparative studies are at fault, the sole purpose of the premenstrual uterine change is to supply a proper nidus for the ovum.

Part two of the third edition of Fabre's[25] *Manual of Obstetrics* appears in a Spanish translation (published 1923), but otherwise unchanged.

Of more recent date (1925) is the second edition of Jeannin's *Obstetric Therapy*[26] which appears in the same Spanish series *Biblioteca de Terapéutica*.

## ENDOCRINOLOGY AND ALLIED SUBJECTS

The second volume of Aschner's *The Constitution of Woman*[27] deals with the special application, while the first volume, previously discussed in one of my reviews, dealt with the general bearings of this subject. All credit must be given to the author for an extremely careful and

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[22] **Herz und Schwangerschaft.** Von Prof. Dr. Walter Frey. Verlag von Georg Thieme, Leipzig, 1923.

[23] **Synopsis of Midwifery and Gynaecology.** By Aleck W. Bourne. Third Edition. Willam Wood and Company, New York, 1925.

[24] **A Textbook of Obstetrics.** By Dr. Thomas Watts Eden, and Dr. Eardley Holland. Sixth Edition. The Macmillan Company, New York, 1925.

[25] **Manual de Obstetricia.** Por el Prof. Fabre. Tomo ii; Parto Patologico. Third Edition. Casa Editorial P. Salvat, Barcelona, 1923.

[26] **Terapeutica Obstetrica;** Tomo xxvi. Por el Dr. Cirilo Jeannin. Second Edition, Salvat Editores, S. A. Barcelona, 1925.

[27] **Die Konstitution der Frau.** Von Dr. Bernhard Aschner. Second Volume. Spezielle Konstitutionslehre. Verlag von J. F. Bergmann, München, 1924.

detailed consideration of his field. The great weakness in his exposition lies in the fact that he is unwilling to acknowledge, or unable to appreciate the fact that our knowledge is most incomplete. His discussion of habits, dyscrasia, plethora, rheumatic diathesis and similar vague concepts are insisted upon *ad nauseam*, and the real value of the book is obscured to the critical reader by the feeling that words frequently hide ignorance. On the other hand, no one can read the book without realizing fully that success in diagnosis and therapy depends upon full appreciation of the patient as a being. Thus, many medical men will be saved from concentrating too completely upon any one organ complex.

Aschner's method of dividing his subject is most interesting and stimulating. Under constitution and sex-phases he places puberty, menstruation and climacteric. Under these main headings every conceivable deviation from the normal is considered. Next he takes up separately, the constitution of various parts of the female sex organs, such as uterus, tube, ovary, vulva and vagina, the connective tissues, breasts, and even leucorrhea. An entire division of the volume is devoted to the effects of the general make-up upon pregnancy and puerperium. Twinning, abortion, and malformation of the fetus are discussed; and also the subject of determination of sex. Of interest is the form of the pelvis regarded from this point of view of development, and, finally, for a German book, an unusually complete bibliography, is appended.

Aschner is evidently a confirmed believer in humoral pathology. He takes for granted, (upon insufficient evidence, in my opinion) .that the menstrual flow acts as a detoxicating excretion, and, in consequence of this belief, practices venesection to an almost unbelievable degree. An immense amount of material is most attractively presented but because of too evident marshalling of evidence to help out the author's thesis, little, if any, credence can be given to his conclusion. The author in other words, in his desire to present a subject of which we know only the elements, in a form of completeness, fails to be convincing. I, therefore, feel obliged to warn the casual reader against accepting Aschner's conclusions in their entirety or in following his therapy blindly. On the other hand, he will derive much profit by visualizing the symptom complexes which the author depicts most graphically.

Swale Vincent's *Internal Secretions*, third edition,[28] is, like the two former editions, interesting reading for the investigator, but the material is too unequally distributed to be recommended to the student. For example, the entire book contains 462 pages of which 150 pages are devoted to the adrenal gland and 39 to the male and female reproductive system. A nonendocrine explanation of sex, as advanced by Crew, is quoted at length, but recent work on the isolation of the female sex hormone, which makes Crew's hypothesis untenable, is not mentioned. On the other hand, the recent work of Carlson and his collaborators on the nonspecificity of "secretine" is fully discussed. Vincent's book has always appealed to me as a valuable bridge between purely theoretical and clinical endocrine writings.

Voronoff,[29] director of the experimental laboratories of the College of France, publishes a further endorsement of his testicular transplants for abolishing old age.

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[28] **Internal Secretion and the Ductless Glands.** By Dr. Swale Vincent. Third Edition. Physicians and Surgeons Book Company, 1925 .

[29] **Etude sur la Vieillesse et le Rajeunissement par la Greffe.** Par Dr. Serge Voronoff. Gaston Doin, Editeur, Paris, 1926.

His main thesis is that unicellular organisms are immortal. Physiologic death is unknown as death in the senium results from intercurrent infection. The main sign of senility is the replacement by the less differentiated connective tissue of epithelium, until proper function is interfered with. To combat this overgrowth is to abolish old age.

To date, Voronoff has transplanted the testes of forty-three monkeys (chimpanzee, cynocephalus, macacus) into man with uniform success. The transplantation of the ovaries of female monkeys into women is also highly successful. Why do the reports of this highly gifted investigator always give the impression of unsoundness? Is it because of the flashy type of presentation or because of a latent, innate prejudice that we harbor against the unusual, unnatural, and bizarre?

Jackson's *The Effects of Inanition and Malnutrition upon Growth and Structure*[30] is a most interesting and valuable collection of all the available data covering this subject. The author, being one of the most prominent workers in this field, has been able to sift and collate the material in such a fashion that it gives an exact picture of our present degree of knowledge. He defines inanition in a broad sense as indicating the lack of food or of any food stuffs (including water) which is essential to living organism. He pursues the subject through plants and invertebrates and especially elaborates its application to the vertebrate types. The second part deals with the effect of inanition, both total and partial, upon the body as a whole as well as upon every system and important organ taken separately.

Jackson agrees with the modern obstetrician that reduction of weight of the human embryo by starving the mother, is an impracticable procedure and that inanition effects the sex ratio in mammals in an as yet unanalyzable fashion. The various types of partial inanition produce the various insufficiency diseases. The osseous and nervous systems are most resistant, while adipose and lymphoid tissues disappear most rapidly. Mass experiments of the effects of famine, as studied during the Great War, would indicate that amenorrhea, and sterility, both temporary and permanent, can be directly ascribed to inanition, and in his conclusion, the author indicates his belief that the germ plasma may be so modified that there is a possibility of influencing heredity and evolution

This book is an important contribution to both biology and medicine.

Kolmer's textbook on *Infection, Immunity and Biologic Therapy*, third edition,[31] is a reference handbook covering the subjects discussed in a very satisfactory way. It contains an immense amount of material with ample references to the literature. This book aims to appeal to the practitioner and student as well as to the laboratory worker and, therefore, has to treat of both elementary and less well-established facts. Chemotherapy is not dealt with because the author expects to publish a monograph devoted especially to this subject. The immense amount of material hardly lends itself to a detailed review. Veterinarians will find much of interest to them included in this volume, because, as this specialty constantly requires the use of laboratory animals, immunologic, diagnostic reactions and specific therapy applicable to the animals are often discussed. The book is too detailed for the beginner who desires a quick means of covering the entire subject, but should prove

[30] **The Effects of Inanition and Malnutrition upon Growth and Structure.** By Dr. C. M. Jackson. P. Blakiston's Son & Co., Philadelphia, 1925.

[31] **Infection, Immunity, and Biologic Therapy.** By Dr. John A. Kolmer. Third Edition. W. B. Saunders Co., Philadelphia and London, 1924.

indispensable to the physician and laboratory worker who care to keep abreast of the times or who desire to do laboratory work of their own.

## MISCELLANY

Volume one of a new collection of monographs dealing with radiology has just appeared.[32] The format, typography, splendid illustrations, and elaborate index reflect praise upon the editors (Holfelder, Holthusen, Jüngling, and Martius). The object is to assemble the widely scattered literature dealing with physics, biology, microscopic anatomy, and practical application of radiant energy.

Fischer, of Frankfurt, discusses aims and results obtained in the röntgen diagnosis of malignant and inflammatory tumors of the large intestine. Friedl and Schinz, of Zürich, take up the question of bone atrophy. A most important contribution is that of Lorey, of Hamburg, on the x-ray picture of acute miliary tuberculosis. Of more theoretical interest is Grebe, of Bonn, on the spectroscope in medical röntgenology, as well as that of Küstner of Göttingen, on the measurement by ionization of Röntgen rays. Glocker, of Stuttgart, takes up the vital problem of filtration and arrangement of portals of entry. Physical sensitization is treated by Holthusen, of Hamburg. The Röntgen-testis is discussed by Schinz and Slotopolsky, of Zürich. Lahm, of Dresden, has been given the chapter on the raying of carcinoma of the cervix uteri, while Kurtzahn, of Königsberg, deals with esophageal carcinoma.

A more detailed discussion of this very important treatise will be taken up after the appearance of other volumes when a full scope of this big undertaking can be judged.

Evans is to be thanked for having translated de Martel and Antione's book on *Pseudoappendicitis*.[33] The name, though striking, is not strictly correct as the subjects dealt with include mainly a cecocolic syndrome. The basic cause of the trouble appears to be a mechanical obstruction, often at the hepatic flexure, producing cecal stasis, dilatation, and functional cecocolic stenosis. Gregory Connell, who has written an introduction for the English translation, says that "If the numerous operators of this country could be induced to read and study this small but important book, much would be accomplished toward transforming them into surgeons, and would bring about a realization of the fact that chronic appendicitis and pain in the right side, either with or without gastrointestinal symptoms, are not synonymous; that instead of being the simplest abdominal surgical condition, it is one of the most complex, and is, therefore, worthy of study, serious study, *before* and not *after* the removal of the so-called chronic appendix."

I am unable to agree with all the evils ascribed by the authors to this syndrome, but I am willing to concede that a thorough study of this book will save many patients from unnecessary operation for "appendicitis," and will throw light upon many obscure complaints. The technical methods of these French surgeons will not appeal to most American operators. A large *T*-shaped incision, spinal anesthesia, Villar's button with seroserous ligature instead of suture, are the main features of their methods.

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[32] **Ergebnisse der Medizinischen Strahlenforschung.** (Röntgendiagnostik, Röntgen-, Radium-und Lichttherapie) Herausgegeben von H. Holfelder, A.M.; H. Holthusen, Hamburg; O. Jüngling. Tübingen; H. Martius, Bonn a. Rh. Volume I. Verlag von Georg Thieme, Leipzig, 1925.

[33] **Pseudoappendicitis.** By Dr. James A. Evans. F. A. Davis Company, Philadelphia, 1925.

Bodkin's second edition of *Diseases of the Rectum and Pelvic Colon*[34] supplies a short readable treatise on this subject. The book gives to the general practitioner an excellent survey of the subject but is hardly detailed enough to make any appeal to the specialist in this line. The author, on the whole, maintains a conservative and fadless attitude.

Theilhaber's[35] seventieth birthday and fiftieth anniversary of medical practice has been commemorated by a Festschrift to which well-known men such as Opitz, v. Jaschke, and Fichera, to mention a few, have contributed. Theilhaber has always stood out as an independent thinker, ahead of his time. He announced that mobile retroflexion produced no symptoms, that dysmenorrhea might be spastic, that myoma uteri was due to chronic hyperemia and carcinoma cervicis to local anemia. Nearly one hundred and fifty articles have been published by him. Eighteen articles covering diverse gynecologic and oncologic subjects contained in the Festschrift.

Barker's book on *Cancer*[36] is a most extraordinary compound of erudition, statistics, ignorance, credulity, and nonsense. The most extraordinary part of the book is that Sir Arbuthnot Lane has lent himself to write the introduction.

The author "has rushed the book out with utmost speed, believing that every delay will cause the unnecessary loss of many lives." His sermon is directed principally to the general public. Cancer is due to chronic poisoning and to vitamin starvation. Barker recounts his own experience; how he was saved from "advanced precancerous condition!" A quite extraordinary volume!

Levinson's *Pediatric Nursing*[37] was written for the instruction of the pupil nurse. It covers the subject adequately. Part III, dealing with the psychologic and sociologic factors, is specially to be commended.

The *Mother's Manual*, by Dorothy Bocker,[38] contains much of interest for mothers, public health nurses, and others, but also so many details, far above the average lay person's knowledge, that it may prove confusing reading.

McLean and Fales[39] offer a short, well-written textbook dealing with the scientific nutrition of infancy and early childhood, which is designed to cover the need especially of the student and general practitioner, as well as of the lay nutritional worker and nurse, but by no means to be spurned by the specialist, because of the good methodical exposition. I would recommend especially the chapter on the treatment of the nervous child. The book is designed particularly to point out the composition of foodstuffs, proper feeding, and the prevention, rather than the treatment, of nutritional disorders.

Hans Much, of Hamburg, in the series of *Modern Biology*, published by Kabitzsch, has written *Aphorisms*[40] which I confess are unintelligible to me, and which those interested will have to judge for themselves.

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[34]**Diseases of the Rectum and Pelvic Colon.** By Martin L. Bŏdkin, M.D. Second Edition. E. B. Treat & Company, New York, 1925.

[35]**Beitraege zu Problemen der Gynaekologie und des Karzinoms.** Festschrift für Hofrat Dr. A. Theilhaber. C. F. Pilger & Co., Medizin. Verlag, Berlin S. W. 48.

[36]**Cancer. How it is Caused; How it can be Prevented.** By J. Ellis Barker. With an introduction by Sir W. Arbuthnot Lane. E. P. Dutton & Co., New York, 1924.

[37]**Pediatric Nursing.** By Dr. Abraham Levinson. Lea & Febiger, Philadelphia and New York, 1925.

[38]**Mother's Manual.** By Dr. Dorothy Bocker. Brentano's, New York, 1925.

[39]**Scientific Nutrition in Infancy and Early Childhood.** By Stafford McLean, M.D., and Helen L. Fales, B.S. Lea & Febiger, Philadelphia and New York, 1925.

[40]**Aphorismen zum Heilproblem.** Von Prof. Dr. Hans Much, Hamburg. Verlag von Curt Kabitzsch, Leipzig, 1925.

Whatever the author's aim may be, he misses the mark as far as I am concerned.

Volumes I and II of the 35th series of the *International Clinics* (March and June) have been received.[41] As usual, a large amount of diverse material is dealt with. Lewellys F. Barker has returned to his early love, the neuron, at least for the moment, and gives us a delightful and instructive talk on psychoneurosis and the milder forms of psychoses. An unusual topic is that of Christopher who deals with the surgical diseases of Meckel's diverticulum. In Volume II, Erdmann deals with a topic of interest to all of us; namely, that of abdominal diagnosis. Krumbhaar enters into the very interesting, although difficult theme of the reticuloendothelial system, as well as some of the defense mechanisms of the body.

Copher and also White have written books dealing with aspects of surgical technic, although the titles are so much dissimilar. Copher's *Methods in Surgery*[42] depict the technics of the Barnes Hospital, St. Louis City Hospital, and the Washington University Dispensary, and emphasizes in particular, history taking, pre- and postoperative care, diets, and all the various minutiae which play such an important rôle in determining whether an operation is to prove successful or not.

White[43] on the other hand, in his *Surgical Handicraft* stresses what we in the United States have called "minor surgery." Although this term might be considered to belittle the importance of the smaller interventions, this by no means holds true, because by proper care, and prophylaxis, the larger and more serious interferences may often be avoided. White's book also considers emergency measures which may arise.

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# Selected Abstracts

## New Growths

**Berard, L., and Dunet, Ch.: Cysts of the Bartholin Gland.** Presse médicale, 1921, No. 104, p. 1029.

Unilateral single cysts of the Bartholin gland are the most frequent. Bilateral cysts are not at all rare and occasionally there are two cysts on the same side. They usually develop between the ages of twenty and forty years. The cysts may involve the glandular structure and consist of dilated acini or excretory ducts; there are also some proliferating cysts and others with a single layer of epithelium.

F. L. ADAIR.

**Pauliucu-Burla: On the Pathology of Vaginal Cysts.** Wiener klinische Wochenschrift, 1923, xxxvi, 639.

Such cysts may arise as the result of pinching off parts of the müllerian ducts during embryonal development, especially those found on the front and back

[41] **International Clinics.** Volumes I & II 35th Series. J. B. Lippincott Company, Philadelphia and London, 1925

[42] **Methods in Surgery.** By Dr. Glover H. Copher. C. V. Mosby Company, St. Louis, 1925.

[43] **A Textbook of Surgery Handicraft.** Dr. J. Renfrew White. Macmillan Company, New York, 1924.

walls of the vagina. These cysts are lined by one or two layers of cuboidal cells, though the vaginal epithelium of the fetus shows a change to a stratified type. The type of epithelium depends on whether the congenital fault occurs high up in the part of the müllerian duct that naturally carries cylindrical epithelium or low down in the region of solid strands of cuboidal cells.

The author had two cases which showed cylindrical epithelium lying on top of stratified epithelium. Some authorities believe that these cysts may arise from vaginal glands. Papillary outgrowths into the cavity of the cyst are found occasionally, and these favor the pinching off theory as regards etiology. The author reports two such cases. No ciliated epithelium was found in any of the author's fourteen cases.

Development from remains of Gartner's duct is the commonest etiology of vaginal cysts. Some cases show multiple cysts along a line running up the vagina. They are lined by cuboidal epithelium.

Cysts which have a lining of thin stratified epithelium may arise from attempts at gland formation on the part of the vaginal epithelium or from inclusions of islands of cells during the healing of birth lacerations.

Lymph vessels may give rise to cysts, their lining consisting of endothelial cells. One case of sarcoma developing in such a cyst has been described. Deep-lying nabothian cysts may resemble vaginal cysts. Vaginal cysts are usually benign.

The author reports two cases with no epithelial lining, it probably having been destroyed by birth trauma. Cysts may be ruptured during labor and may rarely become infected.

He describes three cases accompanied by vaginal septa and infantilism of the genital organs. Other coexisting congenital abnormalities have been described, such as bicornuate uterus, imperforate hymen, etc. FRANK A. PEMBERTON.

**Bland-Sutton, John: The Habits (Ecology) of Tumors.** British Medical Journal, November 10, 1923, p. 847.

The author endeavors to show that in their life history, tumors correspond with the parent organs, pass through a period of growth, attain maturity, exercise in some instances the same function as the parent organ, which leads to an increase in their bulk. They not only agree in structure with the tissues of the organs in which they arise, but they conform to the habits (ecology) of the parent organ. When present in the hollow viscera they may excite these organs to action. They may often initiate functional activity in an organ. He cites submucous fibroids as an example, and calls attention to the fact that these tumors may simulate pregnancy very closely. He also speaks of the erosive action of villi in relation to tumors.

Tumors of glandular organs are frequently endowed with functional activity. He cites various examples. In regard to ovarian dermoids he believes it is an established fact that these tumors differ from ova which have become actively independent of a normal stimulus. An ovarian fetus which we call an embryonal rudiment is produced in this way. He states that "in the common kind of ovarian embryoma the cutaneous elements are conspicuous; the products resulting from the activity of the skin preponderate and make up the bulk of the tumor mass. In mucigenous ovarian tumors the so-called 'colloid stuff' is furnished by the gastrointestinal epithelium of the embryoma"; in them the mucous membrane prevails. In this manner he supports his thesis: "Many tumors become manifest by the accumulation of the products of their own activity." F. L. ADAIR.

**Werner, P.: The Development of Malignant Tumors of the Female Genitalia following Deep X-ray Therapy for Benign Conditions.** Wiener klinische Wochenschrift, 1925, xxxviii, 403.

Since 1922 many authors, including Bumm, A. Beck, Prochownik and others, have reported cases which developed malignant tumors of the genitalia following deep x-ray therapy for benign pelvic conditions. There have been eight such cases observed at the Second Frauenklinik in Vienna, including five cases of carcinoma of the cervix, one of carcinoma of the body of the uterus, one of carcinoma of the cervix and the body, and one case of sarcoma of the ovary. Since there were 2680 cases treated in this clinic by deep x-ray therapy for benign pelvic conditions, the frequency of those developing malignant tumors is approximately 0.3 per cent. The normal rate of malignancy, however, in gynecologic conditions is 5 per cent and the author concludes, therefore, that deep x-ray therapy not only does not predispose towards the development of malignant tumors but is a definite prophylactic agent against such a development.

RALPH A. REIS.

**Steinhardt, B.: Clinical and Statistical Study of Sarcoma of the Uterus.** Wiener klinische Wochenschrift, 1924, xxxvii, 844.

The percentage of myomata that develop or "proliferate" into sarcomata cannot be determined unless all cases of the former would be subjected to operation and to microscopic examination. In order to arrive at some conclusion as to this percentage, the author examined a large mass of myoma material in the Second Frauenklinik in Vienna. She stresses the point that the formation of sarcomata from preexisting myomata is not a "degeneration" but rather a "proliferation," and considers the former term, therefore, a misnomer. During the years 1908 to 1923, there were 1363 cases of myomata of which 38, or 2.78 per cent, showed sarcomatous changes. The author compares these figures with those reported by Frankl from the First Frauenklinik, who reported 1876 cases with 46, or 2.5 per cent, showing sarcomatous changes, during this same period of time. If all cases of myomata, including those not operated upon, were included in this series, the incidence of sarcomata would be 1.84 per cent.

Of the 38 cases of sarcomata, 31 were of the uterus' wall, 5 took their origin from the mucosa, and 2 were of doubtful origin. Sixty-seven per cent began from preexisting myomata. These secondary tumors may be recognized by the ring of unchanged myoma tissue surrounding the sarcoma. Submucous myomata are more prone to sarcomatous changes than are any other type. Histologically, all types of cells were found, the majority, however, being cells derived from undifferentiated muscle cells.

Sarcoma is more common during and after the menopause. In regard to pregnancy: 30 per cent had never been pregnant, and the author, therefore, does not consider frequent pregnancies an important etiologic factor.

There is no definite symptom complex on which to base a diagnosis and in none of the 38 cases was the diagnosis established before the operation. The submucous type is characterized by the friability of the tissues, by rapid growth following removal, by cachexia and by edema of the extremities. In no case was the diagnosis established by curettage.

The prognosis was poor. Of this series, 44 per cent of the cases followed, terminated fatally in from seven to fourteen months. Thirty-four cases were operated upon, and nine showed metastases in neighboring organs, including the ovaries, parametrium, rectum, retroperitoneal glands, and also in the suprarenals, liver, and lungs. The other four cases were considered inoperable. X-ray or radium treatment was given following operation. Twenty-seven per cent were cured. Over 50 per cent died within one year in spite of the fact that they were operated upon early.

RALPH A. REIS.

**Dodd, W. E.: Sarcoma of the Fallopian Tube.** Surgery, Gynecology and Obstetrics, 1924, xxxix, 302.

The author reviews the literature on primary sarcoma of the tube and finds but twelve authentic cases, to which he adds two new reports. The first instance is that of a single woman, age fifty-five years, who for six months had a constant watery discharge from the vagina which became blood stained two months previous to examination. She had no pain. Physical examination was negative with the exception of a vague resistance over the entire right side of the abdomen and slight suprapubic tenderness. At operation the right tube was found dilated and a soft cauliflower-like growth, the size of an olive, protruded from the fimbriated extremity. The right tube was excised with the tumor. The patient made a good recovery, did well, and gained weight for one year following operation, after which no further record of her was obtained. Microscopic examination showed the tumor to be a spindle-celled sarcoma.

His second case is that of a married woman, aged sixty, who had felt weak and in "ill health" for the past year. Eight days before admission to the hospital she began to have a bloody discharge from the vagina. The menopause took place eight years previously. Vaginal examination revealed a vague mass on either side of the uterus. At operation both tubes were found dark in color and distended. Tubes, ovaries, and appendix were removed. Microscopic examination revealed a spindle-celled sarcoma in the wall. Two years later the patient died. At autopsy the lungs were found studded with tumor nodules. A large mass in the abdomen was a tumor which had been diffusely scattered throughout the abdominal cavity. Microscopic examination showed that these tumors were of a character similar to that of the primary growth.

In a total of 1871 salpingectomies, most of them bilateral, all specimens have been studied both grossly and microscopically, and these are the only two instances of sarcoma among them.

WM. C. HENSKE.

**Petersen: Mixed Tumors of the Uterus.** Journal of Laboratory and Clinical Medicine, 1923, viii, 369.

Mixed tumors of the uterus are classed among the malignant growths, although metastases occur late, as a rule. They are composed of mesoblastic tissue, such as smooth and striated muscle fibers, fibrous tissue, fat, bone, cartilage, endothelial tissue, and certain undifferentiated mesoblastic tissues. Quite a number are composed mostly of fat and have therefore been reported as lipomata. Petersen points out that practically all of these, of which histologic studies have been made. were shown to contain other structures as well.

These tumors have been observed in patients from two to seventy-five years of age, 50 per cent having occurred in women over fifty. The prognosis is bad, not so much from the formation of metastases as from local recurrence.

Petersen reports two new cases. One patient died three months after operation and a year after the onset of symptoms, the other being alive and well two years after operation and six years after the onset of symptons.

R. E. WOBUS.

**Johnstone: Adenomyoma of the Uterus With Tuberculous Infection.** Journal of Obstetrics and Gynaecology of the British Empire, 1924, xxxi, 243.

Unlike the ordinary fibroid tumors, adenomyomata of the uterus, devoid of capsule and deriving their glandular elements from the highly vascular endometrium, are relatively free from the various forms of degeneration. Conversely one would expect to find infection through the blood stream relatively common in these tumors. That this is not true is shown by the author's inability to find,

after careful search of the literature, more than six cases of adenomyoma of the uterus secondarily infected with tuberculosis. Where tuberculosis exists in the uterus and ovaries without involvement of neighboring organs (peritoneum and tubes) the inoculation has occurred through the blood stream. Examination of this and the previously reported specimens showed the glandular portions most subject to involvement. In the present case, infection apparently originated in the lungs and spread later to the endometrium from whence the glandular prolongations into the adenomyoma provided ready access into the tumor.

H. W. SHUTTER.

**Vogt, E.: Theoretical and Practical Considerations Arising from the Study of Endometrial-Like Epithelial Growths in the Ovary.** Medizinische Klinik, 1924, xx, 884.

Sampson believes that the ovarian hematomata, which he calls tar or chocolate cysts, arise from islands of endometrium which come from the epithelium of the uterus or tubes. These ovarian cysts may rupture under the influence of menstruation and thereby produce implantations in the peritoneal cavity. The latter frequently resemble endometrium more closely than does the epithelium of the original ovarian hematoma. Menstrual blood which contains pieces of endometrium may reach the fallopian tubes when the passage of blood through the cervix is impeded by blood clots, tissue such as is passed in membranous dysmenorrhea, or because of retroflexion, myomata, polyps, etc.

The symptoms of these endometrial implantations are dependent upon their participation in menstruation, their tendency to produce adhesions in the abdominal cavity, and their invasion of the large intestine. The patients have dysmenorrhea or intestinal complications during menstruation. Palpation reveals a small cystic ovary and changes in the culdesac. Therapy is valuable and conservative treatment is not always successful.

From a prophylactic viewpoint the following considerations are important: In cases of cancer of the uterus, bimanual examination should be gently done. A diagnostic curettement should be done only in suspicious cases and with extreme care. If radium is used, the capsule should be inserted gently. In doing a hysterectomy the uterus should be grasped lightly and all communications between the uterus and the abdominal cavity, such as the fallopian tubes, the uterine and ovarian blood vessels, and the round ligaments, should be doubly ligated before the uterus is removed.

Some cases of tubal menstruation may be only cases where there has been a back-flow of menstrual blood from the uterus. Some cases of extra-uterine pregnancy where no evidence of inflammation or maldevelopment can be found may be explained on Sampson's theory. The occurrence of ovarian pregnancies may be more readily explained if we assume that the fertilized ovum can implant itself on an endometrial-like area which is capable of undergoing a decidual change.

No gynecologic examination should be made during the menstrual period because menstrual blood may be forced back into the tubes. If a retroverted uterus actually favors the back-flow of blood through the tubes, then we should treat retroversion either with a pessary or operation even when no symptoms are present. Obstructions to the cervix, such as laminaria tents, packing, and cervical pessaries, should be avoided. In doing the Rubin test it might happen that epithelium would be blown into the abdominal cavity, especially if the test is performed immediately after a menstrual period. J. P. GREENHILL.

**Von Oettingen, Kj., and Linden, H.: Heterotopic Epithelial Proliferations of Uterine Mucosa in the Ovary and Their Relationship to Chocolate Cysts.** Archiv fuer Gynaekologie, 1924, cxxii, 718.

The authors found twenty cases of cystic ovaries which showed gland tissue resembling uterine mucosa. These cases showed two definite types of structure, —a deep and a superficial. The deep type showed typical areas of uterine mucosa which originated from the ovarian epithelium and dipped down deep into the ovarian stroma. They contained old blood as well as fresh blood and the authors show by their illustrations, definite and well-marked connections between these deposits and the surface epithelium of the ovary. They cannot, therefore, agree with Sampson that these formations result from retrograde deposits which have come from uterine mucosa by way of the fallopian tubes.

The second, or superficial type, resembles uterine mucosa during the intermenstrual period and is situated on the ovary rather than in the ovary. This type results from the rupture of chocolate cysts and not from deposits from the uterine mucosa because, according to the authors, the ostium of the fallopian tube is too small to permit the passage of such bits of tissue.

Women in whom such heterotopic epithelial proliferations are found, are constitutionally inferior. Practically all patients in whom Sampson found this condition had myoma in varying degrees and many suffered also from retrodisplacements of the uterus and adhesions. Sampson has definitely shown that during uterine congestion, blood from the uterine cavity may be expressed through the tubes. This blood irritates the serous epithelium, which is defective, and, under the influence of pathologic hormones, this serous epithelium proliferates into the deeper structures and forms tissue resembling uterine mucosa. As a result of subsequent menstruation, these cells develop into chocolate or tar cysts. Further development is brought about by the rupture of these cysts which leads to secondary implantations. Many chocolate cysts develop from corpus luteum or follicle hematoma, and not all, therefore, can be traced back to this secondary formation caused by irritation. RALPH A. REIS.

**Levy-Du Pan: A Case of Hypernephroma of the Ovary.** Schweizerische medizinische Wochenschrift, 1924, liv, 1198.

The tumor in this location is an extremely rare one. Since 1878 only nine other cases outside of Weise's first report have been described in the literature. Pan's patient was a nullipara, age twenty-six, who came to the clinic complaining of prolaspe of the uterus. It was impossible to restore the prolapse, and abdominal examination revealed a mass as large as a fetal head on the left side. She was later operated and a mass found adherent to intestine, tubes, and uterus. The mass was removed and a ventral fixation of the uterus effected. The pathologic diagnosis on the excised tissue was "hypernephroma of the ovary with rapid proliferation and degeneration—chronic salpingitis." The author discusses the various theories concerning the origin of this tumor and feels that it is due to an embryologic fault since the kidney, testicle, ovary, and adrenal capsule all are developed from closely contiguous structures. The prognosis is always grave because of the tendency to rapid metastasis. A. C. WILLIAMSON.

**Stubler: Heterotopic Epithelial Growths in the Genital Organs, Especially the Ovary.** Deutsche medizinische Wochenschrift, 1924, l, 908.

Stubler believes that if Sampson's endometrial hematomata of the ovary were caused by the back-flow through the tubes of menstrual blood with pieces of endometrium, which become implanted on the ovary, we should expect to find metastases on the pelvic peritoneum in cancer of the endometrium from a sim-

ilar process much more frequently than we do. Further, he believes that the metastases in the tubes in cancer are formed through the lymphatics. He says that it is not proved that this back-flow is more likely to occur in retroflexion, especially as a movable retroflexion is not a pathologic position of the uterus. The adherent retroflexion found in these cases is the result and not the cause of the process. He does not believe that the endometrium cast off during menstruation is viable and does not accept Jacobson's experiments because it is not reasonable to believe that endometrium can be transplanted if such sensitive tissue as that of the ovary cannot be transplanted with success.

He believes that these growths arise from the germinal epithelium of the ovary but he does not account for the blood, blood pigment, and typical endometrial glands which are so frequently seen. F. A. PEMBERTON.

**Kovacs, F.: Thyroid Tumor of the Ovary.** Archiv fuer Gynaekologie,. 1924, cxxii, 766.

The author reports a very rare form of ovarian tumor which he found in a woman, thirty-three years of age, who came to the clinic on account of a goiter and menorrhagia. She had had symptoms of exophthalmic goiter for several years, including protrusion of the eyeballs and nervousness. Bimanual examination showed a tumor the size of a goose egg in the left ovary. This was removed together with a myomatous uterus which also contained polyps. Macroscopically, the ovarian tumor resembled a colloid goiter especially on the cut surface. Microscopically, it proved to be tissue typical of a colloid goiter, with all the structures and staining qualities characteristic of such goiters. Upon examination of the patient nine months later, all the exophthalmic symptoms had disappeared although the goiter was unchanged. The tumor was, therefore, true thyroid tissue functionally as well as structurally and chemically.

The author discusses the etiology of such tumors and states that they may be due to goiter metastases but more probably are teratomatous growths in which the thyroid anlage alone was present or had overgrown the other structures. The distance from the thyroid gland rules out the theory of displaced thyroid tissue anlage. RALPH A. REIS.

**Daniel, C., and Babes, A.: A Study of Xanthoma of the Uterine Tube (Salpingitis Xanthomatosa).** Presse médicale, Dec. 22, 1923, xxxi, p. 1073.

The authors describe in detail the gross and microscopic lesions in three cases, found identical in all respects with those of true xanthoma. This tumor is most common in the skin and in the articulation, and is occasionally found in other parts of the body, but, as far as could be ascertained, has never before been noticed in the fallopian tube. The tumor is usually no smaller than a pea, and is composed of large rounded or polygonal cells, infiltrated with crystals and drops of cholesterin, and contains lipoids. The origin of the cells has not been determined; in some cases, they appear to develop from endothelial cells, in others, from connective tissue cells. In addition to true tumor formation, we find xanthomatous deposits in inflammatory tissue, and at times in other tumors. There is an associated general or local cholesterinemia, and a local lymphatic stasis. The tumors may be single or multiple, often in chains; in the cases reported multiple small tumors were found, in two cases involving the mucosa, and in the third chiefly affecting the muscular wall of the tubes.

Xanthoma of the tube is to be distinguished from pseudo-xanthomatous coloring of the tube wall in salpingitis, from accessory suprarenals of the broad ligament, from caseous tubercular masses, and from lipomata and papillomata of the tube. It is possible that xanthoma of the tube may undergo malignant transformation and metastasize, as has been noted in xanthoma of the skin.

The authors conclude that the presence of this tumor in the tube is accounted for by the local lymphatic stasis subsequent to the primary inflammatory process, together with the local hypercholesterinemia consequent upon the luetin formation in the ovary, which contain large amounts of cholesterin. Thus the two conditions are fulfilled. E. L. KING.

**Spencer: Suppurating Teratomatous Cyst in the Splenic Region.** British Journal of Surgery, 1921, ix, 72.

Partly in vivo and partly postmortem, Spencer removed a retroperitoneal teratoma from a woman of forty-nine years who had borne three living children. The mass was situated in the left hypochondrium, in contact with the left kidney and the tail of the pancreas. Examination of the cyst and its contents by J. A. Braxton Hicks revealed, among pus and debris, a mass of hair, fat, and sebaceous material, and a teratomatous mass. The latter contained bones resembling a pelvis, a femur, tibia and fibula and a pedunculated smaller mass also containing bone. Both masses were covered by skin. Hicks believes this mass to be due to misplaced mesoblastic tissue. R. E. WOBUS.

**Schmid, Hans Herman: Retroperitoneal and Mesenteric Tumors.** Archiv fuer Gynaekologie, 1923, cxviii, 490.

Schmid reports three cases, the first of which was an immovable fibrosarcoma in a twenty year old girl, filling half the abdomen and growing out between the leaves of the mesentery; the small intestine and cecum were adherent to the growth, necessitating intestinal resection with ileocolostomy; there was no recurrence in six years. The second case was a spindle-celled sarcoma, the size of a child's head which separated the peritoneum from the ascending colon for which intestinal resection was done; there was no recurrence within a year and a half. The third case was also a spindle-celled sarcoma situated in the transverse mesocolon, in a woman fifty-five years of age. Schmid also reviews 267 reports of such tumors in literature. An analysis shows that the ages ranged from seven weeks to seventy-three years, 67 per cent occurring in women; the usual complications were rupture into the lumen of the intestinal canal, rupture into the abdominal cavity with severe hemorrhage, suppuration and torsion. He stresses the marked frequency of transition from benign growth to a malignant one. The majority of these growths recur even though, histologically, they are benign. The diagnosis is difficult, but operation should be done early. The operative mortality is still above 7.5 per cent. RALPH A. REIS.

**Becerro de Bengoa, R.: Gynecologic Surgery of Cysts Included in the Iliopelvic Mesentery.** Revista Espanola de Obstetricia y Ginecologia, 1921, vi, 147.

Cysts included in the mesentery of the pelvic colon are almost always treated by the gynecologist because they are generally diagnosed as ovarian or paraovarian in origin. Such cysts may be juxtaparietal, situated midway between the parietes and the intestines, or juxtaintestinal. They give no characteristic symptomatology. The origin of such cysts is probably Wolffian.

Treatment should consist in extirpation. Marsupialization is an incomplete and unsatisfactory procedure. Cysts of the ascending portion of the mesentery should be approached through the left lamina of the latter; they are often difficult to remove owing to their close attachment to the gut. Those of the descending limb are not, as a rule, so closely adherent to the intestine, but often cause great difficulty from their attachment to the iliac vessels and the ureter. In a few cases where the cyst is situated low down a hysterectomy may be necessary in order to expose the field of operation satisfactorily.

THOS. R. GOETHALS.

# Correspondence

To the Editor of The American Journal of Obstetrics and Gynecology:—

The establishment of the Joint Committee on Maternal Welfare has inspired the following remarks by one who is impressed by the magnitude of the task imposed upon this committee. It seems regrettable to me that the men doing obstetrics in this country have been so slow in realizing the necessity for some well-formed plan for carrying on a campaign to lower the fetal and maternal morbidity and mortality. I have often tried to get at the cause of this, located as I am at a distance from any teaching center and pioneering obstetrics as a specialty in this section.

I do not believe that the profession itself is altogether to blame for the deplorable mortality rate. The public at large has been slow in coming to the realization that reproduction is any more than a normal process, and that any more is necessary than to have somebody present to tie the cord, grease the baby, wrap it up, and if by that time the placenta does not come away, for some bystander to remove it by making traction on the cord. Since babies have been born ever since the dawn of time, people are slow to realize that special skill and knowledge born of close observation and training are oftentimes necessary for the happiest results. The average family would not permit the most skilled surgeon to remove an appendix in the home, nor would they argue about the fee for this removal; or if a child's tonsils were to be removed, would the parents hesitate to send the child to a hospital. Nor in either case would they object to paying from three to ten times as much for a comparatively simple operation of a few minutes' duration as they would to pay the physician who should have spent hours at the time of delivery of the mother, to say nothing of the numerous prenatal calls and postpartum attention that she should have had. We as physicians are, of course, somewhat to blame, inasmuch as we ourselves have been slow to recognize and teach the dignity of obstetrics as a profession. We have not put our own house in order, and so long as the surgeons have been allowed to dominate the hospitals and the public allowed to believe that nothing is too good for the surgical departments in the hospitals, that the obstetrical department is unimportant and can be housed in the least desirable quarters, so long will obstetrics continue in the state it is in today.

I so often hear men in general practice say there is nothing interesting in obstetrics, that there is such a sameness to it, that I am convinced that the average man doing obstetrics as a side-line has either become careless and lost his faculty of observation or else he never had proper training or was not taught to be on the lookout for any deviation from the normal. This belief is further confirmed by the too numerous cesarean sections done with insufficient indication, on cases brought to surgeons without obstetrical training or conscience, by men in general practice who are not able to recognize the existing condition and outline its proper management.

Furthermore, the leaders and teachers in the obstetrical field have been too slow in furnishing opportunities for postgraduate observation and teaching. I have spent weeks in several of the larger cities literally begging for an opportunity to observe the routines and advancements being made by the teachers, and it is only in the past few years that any adequate plans and provisions have been made for the man in general practice who has but a few weeks at his disposal to

brush up on this subject. Another deplorable state of affairs is the attitude that the average intern has toward obstetrics. In our city of 100,000 people we have two hospitals of over 100 beds and one of 225. We get interns from the central west medical schools. It is almost impossible to get an intern delegated to a strictly obstetrical service. He is allowed and even expected to look after medical cases of all kinds, scrub up and assist in the operating room with both clean and pus cases, dress clean and pus surgical cases, come into the maternity department, handle newborn babies, assist in the birth room, and children's ward. They do not seem to find time or have the inclination to watch a normal case through labor, delivery, and the puerperal state. It is a common occurrence for me to have a report from three or four different interns on a single woman in labor. How much good do they get from going into the room and seeing this woman once and perhaps not again during her stay in the hospital? This, of course, is the fault of the staff, for its members cannot be made to realize how obviously unfair it is to the intern that he is not given an opportunity and *required* to watch these cases through from beginning to end.

Medical students should be impressed, by the teachers of obstetrics during their student days, with the dignity of obstetrics, and of the important part it plays in the economic and maternal welfare of the community in which they are going to practice. They should be told repeatedly that after they have finished their internship and gone out into practice, obstetrics is going to furnish a large part of their living for a number of years—that they will practice a good many years before they will be allowed to amputate a leg or arm, operate on a hernia, or remove a single appendix. They should be further impressed by the staff and attending men of our hospitals that a large part of the time they spend in the operating room is wasted so far as their future income and practice is concerned, and that the time spent in the operating room should be when they have nothing else to do. The recent graduate has the same exalted opinion of the glare and glory of surgery and the operating room as the laity has, and does not realize that surgery will play a very small part in his practice and livelihood. I believe that much can be done for the future of obstetrics in this country by looking more closely after the training of these younger men. It is a very common occurrence to have them voluntarily speak of their insufficient training and experience, and many of them regret after it is too late that they missed any opportunity to make themselves more proficient in this phase of their professional career.

So far as I know, New York City is the only place offering many opportunities for short courses in postgraduate obstetrics. I have often thought how much good would come if the general hospitals scattered over the country would make provision for men in their locality to come and live in the hospital for a varying length of time—from one month upward and devote their entire time to obstetrical work. I know of many such hospitals having a considerable maternity service, with good attending men who would be glad to discuss obstetrical problems with these visiting physicians and help them in every way possible to get a better understanding of this part of their work. In this way many men would come to learn more about normal labors and the value of the test of labor in questionable cases, and to study the mechanism of labor undisturbed by oversolicitous friends of the patient. The excuse so often given for meddlesome interference and too early attempts at delivery of a normally progressing case is that the family insisted on something being done. This insistence would not be so strong or hard to combat by the attending physician if he were sufficiently sure of himself, so that he could instill in the patient and also her friends that he had the situation well in hand.

I do not believe that much can be done to improve the obstetrics done by men

beyond middle life or the men who are more interested in surgery and who try to interpret everything on a surgical basis and practice obstetrics as a side-line. These two classes of physicians are either too set in their ways or spend too little of their reading time on obstetrical subjects. The only way they can be reached is by a well-organized plan of getting a considerable number of papers every year before the county and state societies. I have often wondered at the intense interest shown in an obstetrical paper read before these societies, and the length of discussion of these papers is usually so great that they have to be cut off for lack of time.

I think it is a wonderful step in the right direction for the JOURNAL to institute a department of maternal welfare. This can be made an immense help to those of us so far out in the "sticks" and can be developed into a clearing house for many problems that we need discussed from time to time.

Nov. 11, 1925. J. D. CLARK, M.D.

ORPHEUM BUILDING,
WICHITA, KANSAS.

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# Items

**American Gynecological Society.** The Fifty-first annual meeting will be held at Stockbridge, Mass., on May 20, 21 and 22, 1926. This will also be the semi-centennial of the founding of this, the oldest national organization of the members of this specialty in the United States.

**Boston:** To commemorate the seventy-fifth birthday of Dr. Charles M. Green, professor emeritus of obstetrics at Harvard University, over two hundred of his friends and colleagues attended a complimentary dinner at the Harvard Club on the evening of December 18th. The Toastmaster was Dr. Frederick C. Shattuck, the former professor of medicine at the Harvard Medical School, and among the invited guests were Drs. Joseph B. DeLee, Emilius C. Dudley, John M. T. Finney, Prof. Charles H. Grandgent, Drs. Barton C. Hirst, George W. Kosmak, Prof. Henry Pennypacker and Dr. John O. Polak.

At the close of the speaking a silver bowl was presented to Dr. Green and also a memorial volume containing an address and the signatures of those who participated in the dinner.

**Chicago:** Dr. Frederick P. Falls, of Iowa City, has been appointed professor of obstetrics and gynecology at the University of Illinois College of Medicine.

**Cincinnati:** The Board of Trustees of the University of Cincinnati have appointed Dr. Chas. L. Bonifield director of the Gynecologic Department to succeed the late Dr. Sigmar Stark, and Dr. Henry L. Woodward, acting director of the obstetric service. The Mendenhall Scholarship in obstetrics for the current year has been awarded to Dr. R. L. Crudgington, resident in the Cincinnati General Hospital.

**Cleveland:** Dr. William H. Humiston has been made emeritus professor in gynecology at the Western Reserve University after many years of service as a clinical teacher in this subject.

**Philadelphia:** Dr. Edmund B. Piper has succeeded to the vacancy on the obstetric and gynecologic staff of the Philadelphia General Hospital caused by the death of Dr. John Cooke Hirst.

**Regional Consultants, New York State Department of Health:** Dr. Geo. W. Kosmak and Frederick W. Rice, of New York City, have recently been appointed members of the staff of the Department of Maternal Welfare, as a part of the movement for lectures and clinics in the postgraduate work in obstetrics.